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Cover Photograph: *Our cover photograph shows Queen Elizabeth II (then Princess Elizabeth) planting an oak tree during her tour of Canada in 1951. The late King, George VI, whose death in February the whole world mourned, had a deep interest in forestry. He was Patron of the Royal Forestry Society of England and Wales, of the Royal Scottish Forestry Society, and of the Empire Forestry Association. The first Commonwealth Forestry Conference under the new reign will take place in Canada in August and September of this year.*
(Photo by courtesy of *Pulp and Paper Magazine* of Canada).

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PRINCIPLES OF FOREST POLICY

THE CONFERENCE was unanimously of the opinion that the Principles of Forest Policy contained in the resolution below should be recommended for the attention of all member governments. This resolution deals only with fundamental principles which must of necessity be interpreted in the light of the social and economic conditions prevailing in each country. It provides a framework on which each and every country can elaborate its own forest policy. Adoption by the Conference of the following resolution is of historic significance in securing better forest management the world over."

With these words the report of the Sixth Session of the FAO Conference prefaces its resolution on *Principles of Forest Policy,* which is reproduced in full overleaf. Representatives of 65 nations attended this session of the Conference, held at Rome at the end of 1951, and thus the resolution may indeed be said to have world wide endorsement. In fact, it is doubtful whether even the relatively few sovereign countries that chose to remain outside the membership of FAO would find anything objectionable in the wording as it stands.

When the creation of FAO was first being discussed during the war years, there was a high feeling of idealism and dedication abroad, as Mr. Dean Acheson, United States Secretary of State, recalled in his address to the Conference. The 1945 report of the Interim Commission on Food and Agriculture to the Governments of the United Nations stated — "In due course, governments may wish to consider the adoption of a formal declaration that recognizes the achievement of the basic objectives (of a world forest policy) as a duty to their peoples, to each other and to the world." It was important, the report said, that all governments should adopt progressive forest policies; the declaration by governments, as proposed above, would constitute an important step in that direction.

It has now been thought timely that such a declaration should be made.

For many countries, fortunately, the resolution expresses nothing that has not been honored for many years. It contains nothing that involves a legal commitment by any country — only a moral commitment to an idea and the force of enlightened opinion. Its very simplicity may be disarming, yet a very considerable amount of thought, discussion and argument went into its phraseology and each sentence has manifold implications.

The whole statement now carries the recognized authority and weight of pronouncements made by an international assembly of the stature of the FAO Conference. For foresters and all others who may be concerned, the resolution provides an instrument and a telling argument for winning acceptance of the principles by politicians and executives whose responsibility it must be to give them life.

Principles of Forest Policy

We reproduce below the full text of the Resolution dealing with the Principles of Forest Policy (Resolution No. 26), to which reference is made in our editorial. This Resolution was adopted unanimously by the Sixth Session of the FAO Conference held at Rome in December 1951. A full report of this Conference is included in pages 29-32.

The Conference

DECLARES its conviction that the forest is a factor of prime importance in the economic, social, and physical balance of the world. Subject to wise conservation and utilization, it constitutes an *indefinitely renewable source* of products which are indispensable to man. The development of standards of living and the growth of world population create ever greater needs for such products, and many countries insufficiently endowed with forest resources must therefore depend upon other countries for supplies. Also, because it provides or can provide employment for many workers, and is a source of raw material to a wide variety of industries, the forest constitutes an important element in the social stability and progress of the world. The forest also exercises vital protective functions in regard to soil, water and climate and, as a result, influences the agricultural economy, the development of hydro-electrical industries, and the general welfare of rural and urban peoples both in the country itself and in neighboring countries.

Both the protective and productive functions may well be vitiated by destructive and careless practices. In order to enjoy to the full all the benefits which forests can afford, both to the country itself and the world at large, it is essential that each country should formulate a sound forest policy.

RECOGNIZES that forest conditions vary widely from country to country. Great differences exist in the forms of forest ownership. Economic exploitation of the forest and efficient utilization of its products necessitate the application of differing techniques and administrative procedures suitable to varying conditions.

Bearing in mind, however, that there are certain basic principles which govern for any country both the formulation and the implementation of an adequate forest policy,

RECOMMENDS, therefore, to Governments the adoption of the principles outlined below.

Part I

Principles Governing the Formulation of a Forest Policy

1. *Each country should determine and set aside areas to be dedicated to forests, whether at present forested or not.* This should be done progressively, if necessary, but always in accord with the country's economic and social policy and taking into account the close interdependence of all forms of land use.

2. *Each country should apply the best practicable techniques in seeking to derive in perpetuity, for the greatest number of its people, the maximum benefits available from the protective, productive and accessory values of its forests.* This implies that:

(*a*) protection should be afforded against damage or destruction by man, or by such causes as fire, insects and tree diseases;

(*b*) production should be organized, in quantity and quality, with a view to obtaining at least a sustained yield as soon as practicable, giving consideration first, to any protective role assigned to the forest, and then, to any other interests, whether world-wide, regional, national or local, that the forest should serve. The country concerned must itself adjudge priorities, taking into account that a forest may be called upon to render multiple services, including offering recreational values, protection for wildlife, and a source of supply of many kinds of produce;

(*c*) economic and rational methods of forest exploitation and of conversion and utilization of forest products should be encouraged, so that the volume and variety of commodities obtained from the raw material furnished by the forest shall be increased to the maximum extent possible.

3. *Adequate knowledge of all aspects of forest resources, forestry, and the consumption and utilization of forest products, is indispensable.* This includes, in varying degrees at the different stages of development of forest policy, a knowledge of the resources available on forested lands or of those that should be made available on idle lands; of the national needs for forest products; of the natural laws that apply to forests; and of the techniques employed in the production of forest crops and the utilization of their products. To this end, research should be organized and expanded to keep pace with all developments in the fields concerned, and the application of the results obtained should be consistently encouraged.

4. *Public consciousness of forest values should be developed by all means possible.*

Part II

Principles Governing the Implementation of a Forest Policy

5. *Forest law* to give effect to the forest policy should be enacted in consonance with the juridical forms and customs of the country. Such legislation should be developed in keeping with the economic and social progress of the country, and should in fact anticipate such progress.

6. A *Forest Service* should be established and staffed by suitably qualified personnel in all its grades to develop and implement forest policy in collaboration with any suitable organizations which may exist, and to administer the forest law. Such a service should be formed on a permanent basis; it should be endowed with adequate authority and financial support, and should work in close association with other governmental agencies concerned.

There should be effective organization to deal with *forest research*, its co-ordination, and the dissemination of results.

7. *Adequate training* should be provided for all concerned with the management of forests or the utilization and processing of forest products. In particular, foresters and allied technicians should be trained in sufficient numbers to staff public services and other interests concerned with forestry and forest products.

For the higher grade personnel, such training should be provided at schools of university standard, established, to the extent that this is possible, in the country concerned. Subordinate personnel should receive suitable basic training to enable them effectively to fulfill their duties.

The Protection of Rural Lands against Fire in New Zealand

by W. Forbes Wright,
Fire Control Officer, New Zealand Forest Service.

This paper was prepared in connection with the Forest Fire Training Program reported in an article in Unasylva, Vol. V. No. 4. *A study will shorty be published by FAO entitled* Elements of Forest Fire Control

In New Zealand, a nation-wide system for protecting rural lands against fire has evolved from that developed in the country's forests, and it possesses the great virtue of providing for the level of organization appropriate to the local fire hazards in each individual district. Forest protection under New Zealand conditions involves control of the use of fire on adjoining agricultural lands; conversely, forestry is fundamental to the land economy of the country, since forests are productive on much non-agricultural land, and, more important, the larger part of the forest estate consists of watershed protection forests. The protection of river catchment areas also involves the maintenance of an adequate cover of vegetation on steep pastoral lands. For these reasons, the conservation of soil and water resources to preserve the productivity of agricultural lands and safeguard hydro-electric power developments entails the fire protection of other rural lands as well as forests. The conclusion to be drawn in so far as New Zealand experience goes is that the fire protection of forests and of other rural lands are inseparable.

New Zealand is a mountainous country, so settlement is at no point very far from steep hills or mountain ranges on which protective vegetation of some sort must be preserved. Sheep grazing in the valleys, the headwaters of major rivers and the high mountain basins, encroaches everywhere upon the mountain forest land. Over most of the country the climate is almost ideal for sheep farming on one system or another: wool growing on the high country, wool and store sheep on the foothills and lower levels, wool growing and stock fattening on the flats and rolling fertile land. In the wetter districts sheep raising gives way to cattle raising on the easier levels and dairy farming on the better land. The forests have been felled or burnt on land suitable for agriculture, and on much that is not. An equable climate and a generally well distributed rainfall have enabled even poor land to be profitably utilized for sheep farming. On scrub lands no more was required than burning, surface sowing, some fencing and stocking. Seasonal burning to control roughage and provide fresh feed has gone hand in hand with sheep grazing on the higher and poorer land.

The clearing and settling of the forests and natural grass lands of New Zealand have created some of the most productive farmlands in the world per unit of labor employed. But there is another side to the picture: soil erosion and declining soil fertility on certain classes of land, flooding and wasting of productive river flats and coastal districts, the construction of costly engineering works for river control, and the acceleration of natural erosion. The last may become a threat to the hydro-electric schemes upon which the country is particularly dependent for its power supply.

In retrospect it can be seen that the settlement of the country by a pioneering stock lacking forestry traditions was bound to mean the destruction of forests on a large scale. To the early settlers only a few species of timber seemed to be of much value, while food and exchangeable produce were their immediate needs. Land suitable for settlement was soon in short supply and settlers had to make their homes and their livings under the conditions open to them. Too often this meant the clearing of land which should never have been stripped of trees, and too often it meant in the long run for the people concerned the waste of a lifetime's hard work. Under different circumstances they would have deserved well of their country.

Conservation and Recovery Measures

Fortunately, the mild climate and adequate rainfall will bring back a vegetative covering on most of the eroded land that has not been bared to the parent rock, provided that fire and over-grazing by stock are eliminated. Besides the organization of a nation-wide system of fire protection under the aegis of the New Zealand Forest Service, the government departments having agricultural and land interests have set up land utilization committees to decide the use of lands belong-

ing to the crown or to be acquired by it. Lands that should be managed for soil and water conservation or for the sustained yield of timber are dedicated as state forest land and administered by the Forest Service. Improvements in farming methods on land subject to erosion, such as aerial top-dressing of hill country, are pioneered by the Soil Conservation Council.

The objectives of the fire protection of rural lands in New Zealand may be summarized as follows:

(i) the preservation of the forests and other protective vegetation of the mountain ranges for the control of erosion, conservation of water resources and timber production;

(ii) the control of burning on steep land in general for the conservation of the soil and regulation of run-off;

(iii) the control of fire wherever burning on rural lands is against the public interest;

(iv) the protection of 860,000 acres (348,000 hectares)[1] of highly inflammable exotic coniferous forests, which must within a generation supply the bulk of the timber required in the country;

(v) the protection of indigenous commercial forests and some 500,000 acres of cut-over forest land that may some day regenerate an indigenous timber crop.

Topography

New Zealand is a mountainous country with less than one quarter of its land surface below the 650 ft. (198 m.) contour. The combined lengths of the two main Islands extends just over 1,000 miles (1,600 km.) with a maximum width of 280 miles (450 km.), and the main mountain ranges run from the extreme south-west of the South Island to the north-east of the North Island, dividing both Islands into eastern and western regions. The South Island is much the more mountainous of the two; the massive, heavily glaciated chain known as the Southern Alps, with major peaks reaching up to 12,347 ft. (3,763 m.) extends the entire length of the island. Mt. Cook in the Southern Alps is the highest peak in the Dominion. In the North Island the higher mountain country takes up one-tenth of the surface and with the exception of four volcanic peaks does not exceed 6,000 ft. (1,800 m.) The two active volcanoes, Ruapehu and Ngauruhoe, are 9,175 ft. (2,797 m.) and 7,515 ft. (2,291 m.) in height respectively. Ruapehu is the highest peak in the North Island. In both islands, there are only relatively small areas of flat lands and these are mostly coastal strips, river valleys and high inland basins. The largest single area of flat land, the Canterbury Plains in the South Island, is 150 miles (240 km.) long by about 40 miles (64 km.) at the widest part.

Climate

Situated between latitudes 30° 4' S. and 47° 2' S., the country lies within the zone of prevailing westerly winds, known as the "roaring forties." Travelling across a thousand miles of open sea from Australia these winds are moisture laden, and as they strike against the main mountain ranges running south-west to north-east, precipitation is generally much greater in the western districts. This is most marked in South Island, where the Southern Alps form a massive barrier. This general trend towards a wet and a dry side is modified by secondary ranges and the steepsided inter-montane depressions. All areas east of the main range are subject to hot, dry north-west winds, which may blow for several days on end during the summer and autumn months; these winds are particularly severe on the Canterbury Plains of South Island.

The New Zealand climate is characterized by relatively mild temperatures all the year round, a normally adequate and well distributed rainfall and a high number of hours of sunshine. Even in wet districts rain falls on surprisingly few days. Strong winds and brilliant sunshine generally dry out the surface quickly even after rain, so that fire hazards can develop in a matter of days on exposed situations. Dry spells and droughts occur in a complex pattern which is not yet fully understood. In most years there is a dry spell or near drought in some part of the Dominion — for instance, in 1949 — in the northern districts of North Island, and in 1950 in the summer rainfall districts of the extreme South and the normally wet west coast of South Island. A wet summer in the usually dry districts often means a dry season in the wet districts, but widespread dry conditions or drought occur only occasionally. A dry spell in the wet districts soon dries out the mosses, lichens and filmy ferns in the rain forest with the result that very high fire hazards develop even when humidities are still above what is normally considered to be the critical level. Complex weather behavior makes forecasting difficult; the pattern of weather is determined by the deflection of the prevailing winds by the mountain heights, so that a shift of even a degree or two in the direction of the wind can change the pattern entirely. Micro-climates are more the rule than the exception.

Land and Land Use

The combined land area of the two islands is 66 million acres. Forests and scrub lands cover 34.8 percent; alpine, sub-alpine, vegetation and bare rocks, 10.5 percent; tussock grass lands, 21.2 percent; sown grass lands, 27.3 percent; cultivated lands and orchards, 2.3 percent; exotic forests, 1.2 percent; residential, roads, rivers, sand dunes and minor waste areas, 2.7 percent. Of 43 million acres of land under occupation, 31.75 million are devoted to pastoral production, 5 million acres to dairy farming, 26.75 million acres predominantly to sheep grazing.

Under such conditions nation-wide fire control on rural lands would be impracticable if it were not accepted by the farming community. It is gratifying to be able to say that the very comprehensive legislation recently brought into force to this end had the support of the national organization of farmers — Federated Farmers of New Zealand.

The system of livestock — pastoral farming as generally practised in New Zealand — is unique in many respects, and is credited with having the highest output of produce in the world per unit of labor engaged. Besides exporting great quantities of meat, butter, cheese, etc., New Zealand, ranking seventh for number of sheep is the third largest producer and exporter of

[1] Throughout this article it is taken that 1 acre = 0.405 hectares.

The photograph above shows a typical scene in one of the vast man-made forests of New Zealand, a type of forest in which freedom from fires is of paramount importance. Below is a view in a typical forest ride, the blocks of conifers being surrounded with belts of broad-leaved trees. The sign, enamelled on metal, is a standard type of the New Zealand State Forest Service.

wool. This specialization on grassland's farming has been brought about by two important factors: the favorable climate and the use of artificial fertilizers. On flat or easy rolling country, where these factors are complementary, there is little erosion or fire danger, since roughage is controlled by cattle and the land is extremely productive; much of this highly productive land was not originally fertile and has only been made so by the system of management employed.

The position is less satisfactory on the steeper and higher country, where the use of fertilizers is difficult or impracticable. This is the case of the tussock grass lands of the South Island and the higher, cleared forest lands of both islands, and it is there that erosion caused by continued burning and overgrazing presents the most serious problems. The hill country grasses, the native danthonias and brown top, ripen early with little leafage, and if they are not grazed down or burnt, become unpalatable, so that sheep do not thrive. Fires lit when the grasses have ripened are fierce and cause such damage to the soil that there is a net loss of fertility. At present, burning is prohibited on lands of this sort during periods of high fire hazard. But the discontinuation of the practice entirely is essential, if the decline in soil fertility is to be arrested. The use of cattle must replace "matchstick farming."

The complete long-term solution of this problem is a matter of economics and correct land use. Land that in the long run can only be farmed at a loss to the community is likely to revert to the Crown, and will then be placed under forest management, either for timber production or watershed protection. Land that can be stabilized by a permanent grass covering will require a more intensive type of management to bring it back into full productivity: resowing, top-dressing, the control of grazing by closer sub-division, stocking with cattle suitable for hill country. For occupiers of such lands with low financial returns, it has been a difficult if not impossible task to improve the system of management, as is reflected in the recent creation of the Marginal Lands Board to provide financial assistance under negotiated conditions of management. A new factor which may be of some importance in the management of marginal lands is aerial top-dressing with fertilizers.

Forests

The primitive forest and scrub land of New Zealand covered some 62 percent of the land area, and probably a third to a half of this area could have been converted to good grasslands without a significant acceleration of the rate of erosion. A peculiar feature of the primitive vegetation is that it evolved over a long period of isolation, free from man and grazing and browsing animals, other than the moa, a genus of flightless birds, some species of which reached 10 ft. (3 m.) in height. The colonization of the country by successive waves of Polynesians, commencing about a thousand years ago, probably made little difference to the forest lands proper, although there are native traditions and other evidence of large fires having occurred. The largest species of moa were creatures of the open scrub and grasslands, and the Maori moa hunters used fires to drive them into the swamps. After the moa had been exterminated, the forests were carefully protected by the Maori as important sources of food such as birds, berries and grubs. Damage to forests or trees brought punishment to offenders within a tribe, and warfare between tribes.

The upper limit of the forests was about 3,500 ft. (1,070 m.), a sub-alpine belt of scrub extended to 4,000 ft. (1,200 m.), and above that level alpine vegetation of one kind or another gradually gave way to the bare rock of the mountain tops. Where rainfalls were very low, from 30 to 35 inches (760-890 mm.) or less, forests gave way to natural grasslands covered by tussocks of ancient matted grasses. Under these conditions, natural erosion was slow and slips had time to heal.

The area under forest and scrub today is estimated to be 23 million acres; the proportion of forest to scrubland is not known exactly because of the numerous types of ownership involved: State, private and Maori tribal ownership. The absolute minimum area of forest and scrub land required to control erosion is estimated to be 20 million acres; so the existing area would appear to be sufficient, it lacks, however, proper distribution, and only 12 million acres are dedicated by statute as forest lands. There is no control over the forest and scrub land on private lands other than the control over burning during hazardous weather conditions. Much of the sub-alpine scrub belt under all forms of ownership has been damaged by fire and grazing, so that many forests are in retreat from the accelerated erosion from above.

Indigenous Forests

The indigenous forests of New Zealand belong as a whole to that great division of the earth's vegetation called rain forests, and are divided into two classes: sub-tropical and sub-antarctic, the former being a mixed community of broad-leaved trees and conifers, and the latter a pure community of two or more species of beech (*Nothofagus*). Between these main classes, there are many intermediates. Broadly speaking, the mixed forests are the forests of the better lands on the lower and more accessible levels, and the beech the protection forests on the mountain core of both Islands. Both classes of forests are for the most part over-mature and stagnant. The principal commercial softwood species in the mixed forests, which up till now have supplied the bulk of the timber for domestic requirements, are exceedingly slow growing and are unstable on their present sites, probably because of a climatic change in the past. They do not re-establish themselves after logging, except in a few favorable localities; the second crop usually consists of hardwoods of little value. These forests can no longer supply all the timber required in the country and must now be conserved to supply the better grades and finishing timbers needed; the exotic forests must supply the less-exacting grades. From the point of view of fire protection, the principal feature of these forests is their inability to re-establish themselves, and the difficulty of artificial establishment. The management and silvi-cultural problems of these mixed forests are without parallel in any other part of the world. The beech forests are more resilient and amenable to management; but they are very inflammable and a fire through a beech forest may mean its destruction for all time. Seed years are unreliable, and a ground fire through a forest between seed years will

Two "quad" (four-wheel drive) fire engines, standardized with the New Zealand Forest Service for fire control, are seen above; in between them are two tankers, also part of the normal fire-fighting equipment. Opposite, a radio-equipped truck is in operation at the scene of an actual fire. Radio is being increasingly used as a weapon in forest fire control.

kill the trees; the forest can then only re-establish itself from the slow spread from adjoining untouched forests, a process taking centuries at the best. The mixed forest, on the other hand, is not inflammable under normal weather conditions, but very destructive fires have occurred under abnormal conditions. The usual fire damage to this type of forest comes from scrub and bracken fires which sweep into the margins of the forest; the scorched trees die and bracken and scrub encroach, creating vulnerable salients from which succeeding fires sweep further in. The actual area of forest lost in any one fire is generally not great, but it is often a permanent loss, and it is the aggregate of such relatively small fires year in and year out over the whole Dominion which gives concern. Logged areas are of course very inflammable and when burnt over may be permanently lost to forest. Repeated burning brings absolute bareness and devastating erosion.

Exotic Forests

The State exotic forests consist for the most part of *Pinus radiata, P. laricio, P. ponderosa, P. strobus, P. patula* and Douglas fir (*Pseudotsuga taxifolia*), and to a minor extent of such species as larch and Lawson's cypress (*Cupressus lawsoniana*). *P. radiata, P. laricio* and Douglas fir occupy the largest areas. The purpose of establishing the exotic forests was to supplement the rapidly diminishing indigenous forests, and forest policy has been put in a nutshell as "conservation of the indigenous forests and expansion of the exotic forests." All the successfully established exotic species have extremely rapid growth rates, but that of *P. radiata* is extraordinary, which is the reason why very large forests of the species were established by afforestation companies on share capital. The total area of exotic forests is 860,000 acres, of which 450,000 acres are State forests and the rest owned by afforestation companies, local authorities and others. The largest State forest has 262,000 acres actually under trees (gross area 344,400 acres), and is probably one of the largest man-made forests in the world and one of the largest concentrations of annual wood growth. The largest private exotic forest has 160,000 acres under trees. In the near future the exotic forests will be the source of most of the softwoods, newsprint and other forest products used in New Zealand, and will provide considerable exportable surpluses of timber, newsprint and pulp.

The fire risk in the exotic forests is very high and the fact that there has been little silvicultural work in most of the forests adds to the risk. The bulk of the exotic forests is situated in the central volcanic plateau of North Island, where dry summers are the rule. All the State exotic forests have, however, effective fire organizations, and fire losses have been small. Severe fire losses have occurred in privately owned forests, but the largest company forests are now reasonably well organized for fire protection, and are included in the Forest Service radio and weather networks and aerial patrols.

New Zealand Forest Service

Towards the end of last century, when it was becoming apparent that the forest resources were not inexhaustible and almost irreparable losses were being caused by indiscriminate and even wanton destruction, a Forestry Branch of the Lands and Survey Department was formed for the administration of the forests on Crown lands. Statutory provisions were enacted for the protection of forests in 1874, 1885 and 1908. These powers were largely inoperative; they were in advance of public opinion generally and there was not sufficient staff to enforce them; access and communications in country districts were primitive and difficult. It was not until the Forests Act, 1921-22, established the present Forest Service that the administration and protection of State forests were put on a satisfactory basis.

New Zealand's national policy is briefly as follows:

(i) to ensure ample timber supplies for both the present and the future population of New Zealand;

(ii) to protect and regulate stream flow by preserving protection forests at the headwaters of all important streams;

(iii) to maintain productive forests on non-agricultural land which if deforested might be turned into impoverished wastes;

(iv) to transfer to forest management all existing and future forests of which stream flow, soil fertility, climate and public health depend.

These principles have governed the operations of the Forest Service for the last 30 years. The Forests Act, 1949, made no change in the governing principles, but consolidated the amendments to the original Act and redefined, with some extensions, the responsibilities of the Forest Service for the control and management of State forests for the purpose of water conservation, soil stabilization and balanced land use. The Act makes specific provision for land under any tenure to be acquired if it is showing actual or incipient erosion.

The fire protection policy of the Forest Service follows from the premise that, notwithstanding the generally favorable climate, fire is the greatest single menace to forests and protective vegetation in New Zealand: within a few hours fire can undo the work of centuries in building up a valuable soil-vegetation complex.

Fire Control Measures

The Forests Act, 1921-22, provided for the constitution of fire districts consisting of a State forest and a belt of surrounding land of sufficient width to give reasonable protection, and for closed fire seasons during which fires could not be lit without a written permit from a forest officer. The provision for fire districts could only be applied for the protection of forests at which forest officers were available for the administration of the district; so the Act laid down certain more general provisions for the protection of State forests. The principle of protection by means of fire districts was extended in 1925 to cover private forests having an area of not less than 200 acres. The executive officers of afforestation companies and other forest owners were appointed honorary forest rangers under the Forests Act for the purposes of the administration of the districts. In 1932 and 1940 the Lands Act was amended to give the same protection to sand dunes, peat lands and certain other areas.

The provisions of the Forests Act relating to the protection of forests were enforced as rigidly as was possible at the time with the magistracy not always sympathetic. These were shock tactics, but they were necessary in a community that had a tradition of free use of forests and forest destruction.

This situation was satisfactory as far as it went, but it left large areas of inflammable vegetation over which there was no authority for controlling the lighting of fires even during hazardous weather conditions. Large fires could build up in these areas until they brought damage and destruction to farm property, forests or protective vegetation. In most cases private forestry interests confined themselves strictly to their legal responsibilities and refrained from taking any action until their own properties were threatened. In many instances what could have been dealt with as minor outbreaks were allowed to develop until they were more than could be handled with limited resources of the companies concerned and the Forest Service had to be called in to help fight the fires. The need for legislation to deal with fire protection on a national scale was early recognized, but it was not until 1946, a year of disastrous fires in private forests, that there was public support for such legislation; the Forest and Rural Fires Act was passed in the following year.

The Forest and Rural Fires Act, 1947, was framed in the light of 30 years of New Zealand Forest Service experience in fire prevention, and its provisions are in consequence so sound that the Act should stand, with minor amendments to meet changing conditions, for a very long time. There is now practically no land in New Zealand for which there is not some authority for the control and prevention of fire.

The statutory provision for fire protection in New Zealand may be summarized as follows:

(i) the Fire Services Act, 1949, provides for the constitution of Urban Fire Districts, mainly in commercial and residential areas, under the control of Urban Fire Authorities;

(ii) the Forests Act, 1949, provides for fire prevention and fire control on State forest land that is not protected by a Rural Fire District;

(iii) the Forest and Rural Fires Act, 1947, provides for the constitution of Rural Fire Districts and for fire prevention and control over the whole of the rest of the Dominion.

Provisions of the Forest and Rural Fires Act, 1947

The Forest and Rural Fires Act provides for land on which high fire hazards recur annually to be covered by Rural Fire Districts administered by Rural Fire Committees or the Minister of Forests: the rest of the Dominion with the exception of certain areas is placed under the control of the County Councils, which are appointed as Fire Authorities with powers of declaring an emergency during periods of high fire hazard. In this way the level of organization and the expense of fire protection are commensurate with the risks in each individual district, and control is exercised by men with intimate local knowledge, who will not impose unnecessary restrictions.

The Soil Conservation and Rivers Control Council

The Soil Conservation and Rivers Control Act, 1941, makes provision for fire prevention and control. The Act is administered by a Council composed of the Permanent Heads of several Government Departments and five representatives from local bodies. Provision is made for the constitution of Soil Conservation Districts under the direct control of the Council or a Committee appointed by it, and for the constitution of Catchment Districts and their control by elected boards. Only one Soil Conservation District has been formed so far, and, under the Forest and Rural Fires Act, the Council is the Fire Authority for the District. Eleven Catchment Boards have been formed, and these Boards by the provisions of the Soil and Rivers Control Act have certain limited powers for the making of by-laws prohibiting the lighting of fires. They have no authority under the Forests and Rural Fires Act, unless the Country Councils within a Catchment District appoint officers of the Board as Fire Officers under the provisions of the Forests and Rural Fires Act.

Provisions of the Forests Act 1949 Regarding Fire

State forests that, because of administrative difficulties, are not protected by a Rural Fire District are protected by provisions in the Forests Act. These may be summarized as follows:

(i) it is an offence to light fires without lawful authority, on State forest land, or within a mile of such land if any forest produce is endangered; or to leave untended a fire likely to spread to forest land;

(ii) it is an offence to leave anything burning or smouldering on State forest land;

(iii) right holders on State forest land must provide fire fighting equipment. The right of appeal to Fires Appeal Tribunal is provided;

(iv) every person becoming aware of a fire on State forest land or within a mile thereof must try to extinguish the fire, or to notify the Forest Officer if he cannot extinguish it and then to return to the fire until the fire is out or a Forest Officer approves his leaving;

(v) right holders and land occupiers are under similar obligations and must use their employees in fire fighting;

(vi) fit men over 18 years of age may be requisitioned for fire fighting; provision is made for their remuneration and protection under the Workers Compensation Act 1922;

(vii) costs of fire fighting by the Forest Service have to be borne by the owner of the land on which fire started if the fire endangered State forest land, or by the owner of the land whose property was protected, if the Minister so decides. Provision is made for appeal to the Fires Appeal Tribunal.

The Fire-Protection Organization of the Forest Service

The Fire-Protection Organization of the Forest Service operates over the whole Dominion, covering State forests, forests on other Crown lands, scenic reserves and national parks. The organization has also the responsibility of securing co-ordination and uniformity in the administration of the Forest and Rural Fires Act by other Fire Authorities.

The provision of a fire-hazard prediction and warning service is an essential function of the Fire-Protection Organization. A Dominion-wide network of fire-weather stations and radio stations has been set up, and weather readings are radioed twice daily during the fire season to the Head Office of the Forest Service in Wellington. The fire-hazard situation in any part of the country is known in Wellington within an hour of readings being taken at the stations; which enables appropriate action, such as advice to Fire Authorities, broadcasting of warnings and alerting of field staff to be taken as the circumstances require.

The Head Office of the Forest Service includes a Fire-Control Section, which is responsible for the overall control of the Fire-Protection Organization. The personnel of the Fire-Control Section consists of the Fire-Control Officer, a Fire-Protection Inspector and a Communications Officer, and the section has the following specific responsibilities:

(i) seeing that the Fire-Protection Organization is effective wherever the Forest Service has fire responsibilities;

(ii) regular inspection of district fire organization;

(iii) training of personnel in fire protection and fire-fighting, and lecturing at fire courses at the Rotorua Forestry Training Center (other Fire Authorities send officers to the courses);

(iv) advising and guiding Fire Authorities;

(v) co-ordinating operations during a major fire emergency.

In the event of very critical conditions and continued fire-fighting in any one district, equipment and relieving staff are transferred from districts where conditions are safe at the time. Plans for co-ordinating assistance from the Armed Forces and other organized bodies of men during a major emergency are made before the commencement of the fire season each year.

In a Forest Conservancy the Senior Field Officer is the Fire Control Officer, and he is responsible for (i) the efficiency of the Fire-Protection Organizations within the Conservancy; (ii) Conservancy and Station fire plans; (iii) co-ordination of fire-fighting operations; (iv) public relations, legal matters and general administration; (v) co-operation with other Fire Authorities; and (vi) the standard and adequacy of fire equipment on all logging operations under Forest Service administration.

Fire-Protection of State Exotic Forests

The fire hazard in exotic forests is very high and destructive fires are always a definite possibility. On the other hand, exotic forests generally have an adequate personnel, and are well roaded and have a high standard of efficiency in fire organization.

Standard U. S. Forest Service lookout cabins are located on all the larger forests, usually two or more to enable fires to be pin-pointed by cross bearings. The lookouts are equipped with Osborne Fire Finders, radio and telephones. Trained fire crews are held at or within call of Forest Headquarters, and also sub-headquarters in the major forests, according to the weather conditions. The standard of dispatch during high hazard weather is that the first crews shall be away within one minute from the receipt of an alarm. Internal precautions are rigidly enforced, and stringent control over burning is exercised within fire district zones in co-operation with the adjoining land-owners.

An aerial patrol is maintained by the Royal New Zealand Air Force during the fire season in the central plateau districts of the North Island, where the main exotic forests, State and private, are located. Aerial patrols are carried out in other districts in times of extreme fire risk.

Indigenous Forests

A lesser intensity of organization is necessary for indigenous forest protection. Fires do not spread quickly in the virgin forests under normal conditions, but they are extremely stubborn to control; deep humus and litter, old buried logs of durable timber, and dry standing snags may all smoulder for a long time and throw sparks over the fire lines during strong winds. Fire Plans for indigenous forests usually consist of details of areas to be protected, contacts, men available from sawmills, Public Works gangs and other men in the district. Equipment consists mostly of back-pack pumps, saws, axes, grubbers and power pumps. Water is the most effective means of getting these fires under control. Cut-over areas are very inflammable and here again water is the best means for checking fires.

It is impossibile to give direct patrol attention to the majority of indigenous forests, and sawmillers, honorary rangers, settlers and other public-spirited persons have to be relied upon for information.

Conclusion

New Zealand became British territory in 1840, but the Forest Service was not established until 1922. The first 80 years of European settlement might be called the era of "fell and burn"; in the next 30 years there were great changes: a nation-wide fire-protection organization was created, and the incidence of forest fires was reduced very nearly to those caused by accidents or through lack of understanding of fire behavior.

Situated on top of a hill in the middle of the forest, this fire look-out station is typical of those in the New Zealand State Forests. The rugged scenery in the background is more usual in this country than is a large area of level forest such as that seen on page 6.

The use of forests for recreation is increasing and the Forest Service encourages such sports as mountaineering, tramping, deer stalking, wild pig hunting and trout fishing, as well as the gentler pleasures of picnicking and forest walks. Through educational media and public relations the Service has undertaken the positive task of creating a definite forestry tradition, and as the older generation of New Zealanders is showing a growing appreciation of the forests and forestry, a younger generation is coming on which accepts forestry as having a natural place in the national life. This is the best kind of forest and rural fire protection.

The Cork Industry in Portugal

by J. L. Calheiros e Meneses,
President, Junta Nacional da Cortiça, Portugal

A note on the first meeting of the FAO Permanent Working Party on Cork, held at Lisbon in May 1951, appeared in Unasylva, Vol. V, No. 2. *In view of the interest aroused by this meeting, the President of the Junta Nacional da Cortiça was asked to summarize in an article the part that cork played in the economy of his country. Portugal produces about half the world output of commercial cork, and its exports over recent years have accounted for around 70 percent of world trade.*

The cork oak (*Quercus suber L.*) finds its most suitable habitat in the western Mediterranean.

An abundant and evenly distributed rainfall, short summer dry periods tempered by atmospheric humidity, very mild winters, clear skies and plenty of sunshine, very permeable, moist and deep siliceous soils — these are the ideal conditions for the economic cultivation of the species. Such conditions are in fact found only in the Mediterranean zone, and, more particularly along the Atlantic shore.

Production

The cork oak and cork production are therefore characteristic of a very small number of countries whose relative importance is noted on Chart I, drafted from figures taken from a monograph published in 1947 by the FAO Regional Office in Europe entitled *Cork Production and International Cork Trade.*

This chart shows the importance of Portugal in the cork-growing world; in fact, nearly one-third of the total cork oak area, estimated at 2,150,000 hectares (5.3 million acres) is in Portugal, which produces approximately half the cork harvested annually in the world (about 310,000 tons).

Cork oak stands extend throughout the country although the intensity of production and quality of the cork vary in the different producing zones. The species, which covers approximately 8 percent of the total area of Portugal and constitutes 28 percent of its forests, grows best in the central and southern parts of the country where the largest stands supplying the greatest percentage of high grade cork are to be found.

The best quality cork is obtained from the province of Algarve and some parts of Alentejo, that produced in the north of the country usually being inferior. As regards quantity, the central and southern zones rank foremost as can be seen from Table 1, which gives the average production per district on a 9-year-cycle basis. Portuguese law prohibits stripping the trees more than once every nine years in order to protect the species.

As can be seen, the districts of Santarém, Évora, Setúbal, Portalegre and Beja are the most important, since their cork groves supply about 90 percent of the total Portuguese cork production.

Obviously Portugal could not fail to profit from a tree with which it has been so generously endowed by nature. Consequently every government has followed the traditional practice of protecting the cultivation, exploitation, propagation and improvement of the cork oak through appropriate measures. Finally, there has come the establishment of a special research institute — "Estação de Experimentação Florestal do Sobreiro" (The Cork Oak Forests Experiment Station) — which has made an important contribution to the study of problems concerning the anatomy, physiology, cytology, genetics and the phytosociology of the species, with a view to devising more rational cultivation techniques, improving the quality of the cork and also increasing yield. These efforts are justified by the preference shown by buyers for Portuguese cork, as is evident from the high overseas demand.

Table 1 — Annual Average Production of Portuguese Cork (1941-1949)

District	Tons	%
Aveiro	302	0.2
Beja	14 804	10.1
Braga	314	0.2
Braganza	1 929	1.3
Castello Branco	3 901	2.6
Coimbra	557	0.4
Évora	31 596	21.5
Faro	3 690	2.5
Guarda	245	0.2
Leiria	889	0.6
Lisbon	821	0.6
Portalegre	25 624	17.4
Oporto	164	0.1
Santarém	31 912	21.7
Setúbal	29 194	19.9
Vianna do Castello	58	0.0
Villa Real	563	0.4
Vizeu	384	0.3
Total	146 947	100.0

Industry

Formed of myriads of minute cells with very fine, highly resistant, cutin membranes enclosing a gaseous mixture similar to air, the tissue which covers the cork oak, because of its structure, has special properties making it ideal for the many current and expanding needs of industry.

Cork is an extremely light, compressible, elastic and flexible material, practically impervious to moisture, and to liquid and gaseous substances. It has a very high coefficient of friction, is a poor conductor of

electricity, sound and heat, and has an exceptional shock-absorbing capacity; it is also proof against most chemical substances and has virtually unlimited durability.

The combination of such qualities in one substance led naturally to its industrial utilization, which dates back to very remote times. It only became important however after the invention of glass bottles, which opened up immense prospects for the sale of beverages and raised the problem of large-scale production of suitable stoppers. The stopper industry, which began in the Iberian peninsula, has continued to expand to the furthest corners of the globe. Later a new type of stopper was devised — the American stopper or crown-cork — requiring a much smaller quantity of raw material than the ordinary stopper. This stopper, which consists of a metal or bakelite cap with a thin cork disc inside, has proved eminently satisfactory. The crown-cork began to be utilized on a large scale for bottles containing beer, mineral waters, fruit juices, pharmaceutical preparations, preserved foods, etc.

Two utilization problems, however, arose: that of the high percentage of waste accruing from making stoppers, discs and other products manufactured from natural cork, in order to reduce costs; and that of low-grade cork which is not suitable for such articles. The production, towards the end of the last century, of agglomerates made of cork wastes solved these problems and opened new avenues for the cork industry. From this moment, thanks to successive technological improvements, it has been possible to evolve cork agglomerates to meet the most important and the widest range of needs.

Today, the cork industry is a vital force. As a result of increasing research on cork products, it has spread from one zone far beyond the cultivation limits of cork oak and has attained considerable size in many countries, some of which have tried to adapt the tree to their soils, an attempt which so far does not seem to have met with great success.

Among the present non-producing centers where cork products are manufactured on a large scale, the United States ranks first. The potential of the American cork industry is very great, as can be surmised from the fact that it employs 6,000 to 7,000 men and comprises several score factories where almost half the world's cork crop is processed, with an output worth over 40 million dollars.

Among the products manufactured in the United States, the agglomerates predominate, as is fully justified by their use in cold storage and air-conditioning plants, in the automobile industry, textile machinery, electrical appliances, etc. The production of natural cork commodities is much smaller and represents only about 6 to 8 percent of the total output. Cork, which is in high demand in peace time, is considered by the United States as an essential raw material in time of war and is even listed as one of the most important strategic materials; it is used in the manufacture of various items of military equipment, insulating material, attachments or fittings for aircraft, etc.

Among other non-producing countries which have a fairly important cork industry may be mentioned Argentina, Australia, Belgium, Brazil, Canada, Chile, Czechoslovakia, Denmark, Germany, Japan, Mexico, Netherlands, the Scandinavian countries, the United Kingdom, Uruguay, and the U.S.S.R.

Obviously, the producing countries play an important part in the industrial utilization of cork, and of these, Portugal, rightly occupies the foremost position. It has 500 factories which employ about 20,000 workers, equipped with the latest machinery and utilizing the latest technological advances, enabling the industry to meet the demand for any product. This industry produces stoppers, discs, different types of floats, shoe soles, printing paper, cigarette tips, bath mats, table mats, hat bands, fishing rod handles, different kinds of packing. Cork wool is produced for cushions and mattresses and granulated cork employed chiefly as insulating material in ship-building, as a protective

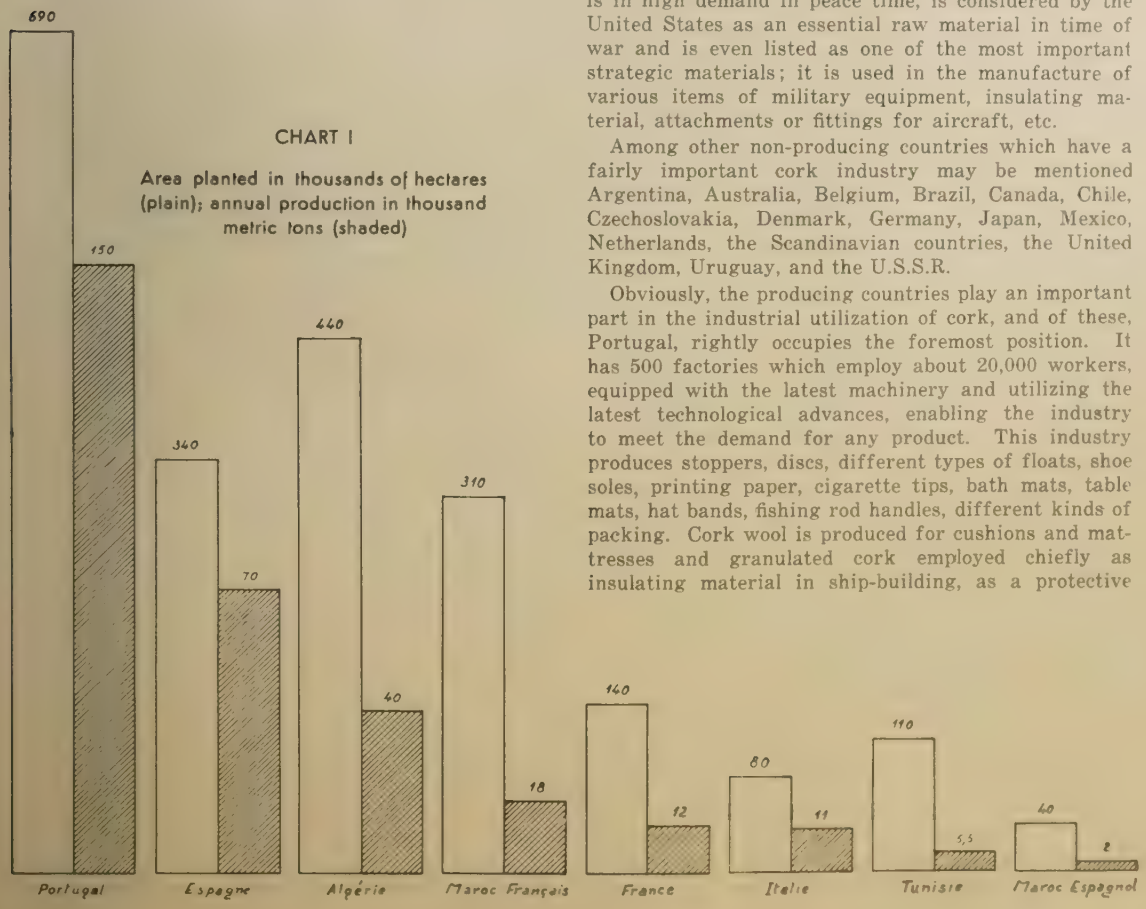


TABLE 2 — PORTUGUESE CORK EXPORTS

Consumer Countries	1937-39 (average)					1948-50 (average)				
	Raw Cork		Manufactured Cork		Total	Raw Cork		Manufactured Cork		Total
	Tons	%	Tons	%		Tons	%	Tons	%	
United States	54 128	99.8	130	0.2	54 258	74 939	96.3	2 890	3.7	77 829
United Kingdom . .	25 284	75.0	8 425	25.0	33 709	22 753	61.2	14 395	38.8	37 148
Germany	20 810	94.1	1 314	5.9	22 124	6 721	95.8	291	4.2	7 012
Other Countries . . .	37 267	83.2	7 532	16.8	44 799	34 792	68.0	16 399	32.0	51 191
TOTAL . . .	137 489	88.8	17 401	11.2	154 890	139 205	80.4	33 975	19.6	173 180

packing for fruit and eggs, and as tubing for plastic substances.

The demand for Portuguese agglomerates has increased rapidly. *Pure* agglomerates, so called because agglutination is produced solely by means of the natural cork resins, are extensively employed as insulating material in buildings, acoustic insulators and correctors in theatres, lecture halls, etc., for absorption of vibrations produced by heavy industrial machinery, and for wall and floor coverings. *Composite* agglomerates, made with auxiliary substances, are used for discs, soles, packing for machinery, sleeves and other casings for the textile industry, sports gear, electric appliances, etc., as well as household articles and numerous other goods for widely differing purposes.

An industry has recently been started for the chemical disintegration of cork for the purpose of producing a wax with a very high melting point and capacity for absorbing solvents, excellent as a substitute for *Carnauba*[1] and *Candelilla*[2] wax, and also to obtain suberolin, a non-fusible, insoluble substance. Very promising prospects are undoubtedly open to these new products which will be utilized in making carbon paper, polishes and polishing waxes, varnishes for metallic containers for food preserves, and for impregnating fishing nets, etc.

Trade

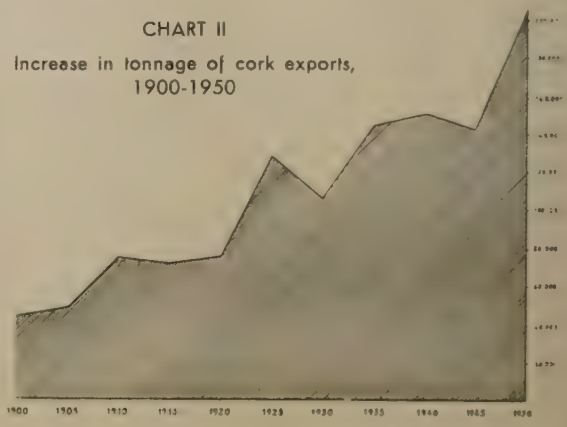
The cork trade today has become very important and forms an immense network covering practically the entire world. The annual world expenditure on cork products may be estimated at 100 million dollars, a figure which gives some indication of its importance.

Cork is the most important of Portuguese exports and alone represents about 16 percent of the total foreign income derived from trade. Cork exports are steadily increasing, as can be seen in Chart II which shows from the beginning of this century, by 5-year periods, the increase in cork tonnage exported.

The only years which show no increase are 1915 and 1945, abnormal years because they fall within war periods, and 1930, a year of world economic depression.

Portuguese cork exports are directed to three main consumer markets — the United States of America, the United Kingdom and Germany — which absorb approximately 70 percent of the total. Among the other consumer centers scattered over the world the most important are: Australia, Belgium-Luxembourg, Brazil, Canada, Czechoslovakia, Denmark, the Netherlands, Japan, Mexico, Norway, Russia, Sweden, Switzerland and the Union of South Africa.

Table 2 shows the average tonnage of Portuguese exports of raw and manufactured cork during the three-year periods 1937-39 and 1948-50; figures are given for the three principal consumer markets. This table shows the expansion of Portuguese cork, due mainly to the marked increase in demand for manufactured cork, both in quantity and percentage, an increase which raised exports to double the total before World War II.



This increase is the result of research and marketing efforts, and the quality and reasonable prices of cork manufactured in Portugal are becoming universally recognized. Even the United States, despite its own important manufacturing industry, has raised its imports of Portuguese finished products by approximately one-fifth during this period.

Amongst the other important consumer countries, Germany had its economy completely disrupted by the war and is only now gradually recovering; the United Kingdom, however, traditionally the largest buyer of Portuguese manufactured products, has nearly doubled its pre-war purchases during the 1948-50 period.

[1] A product of the Brazilian wax-palm (*Copernicia cerifera*).

[2] Obtained from *Euphorbia cerifera* Alc., a shrubby plant native of the drier parts of Mexico.

Portugal has an organization for co-ordinating cork activities — the "Junta Nacional da Cortiça" — whose task is to supervise and guide the cork industry and trade. Its main objectives are to expand the country's export trade; to guarantee the quality of the products exported and protect their trade reputation. The "Junta" has a Cork Research and Experiment Laboratory qualified to test manufactured articles, to compare cork products with possible substitutes and to discover new properties as well as new uses for cork.

Portugal has given every care to production in order to increase its cork-oak stands and to improve the quality of the cork, and possesses industrial plants capable of meeting all demands for manufactured products and of maintaining a well-established trade of high repute with assured economic prospects. A traditional industry, this branch of production will undoubtedly be able to adapt itself, as a result of the experience acquired over many years, to future directives and trends.

Forestry Possibilities in Ethiopia

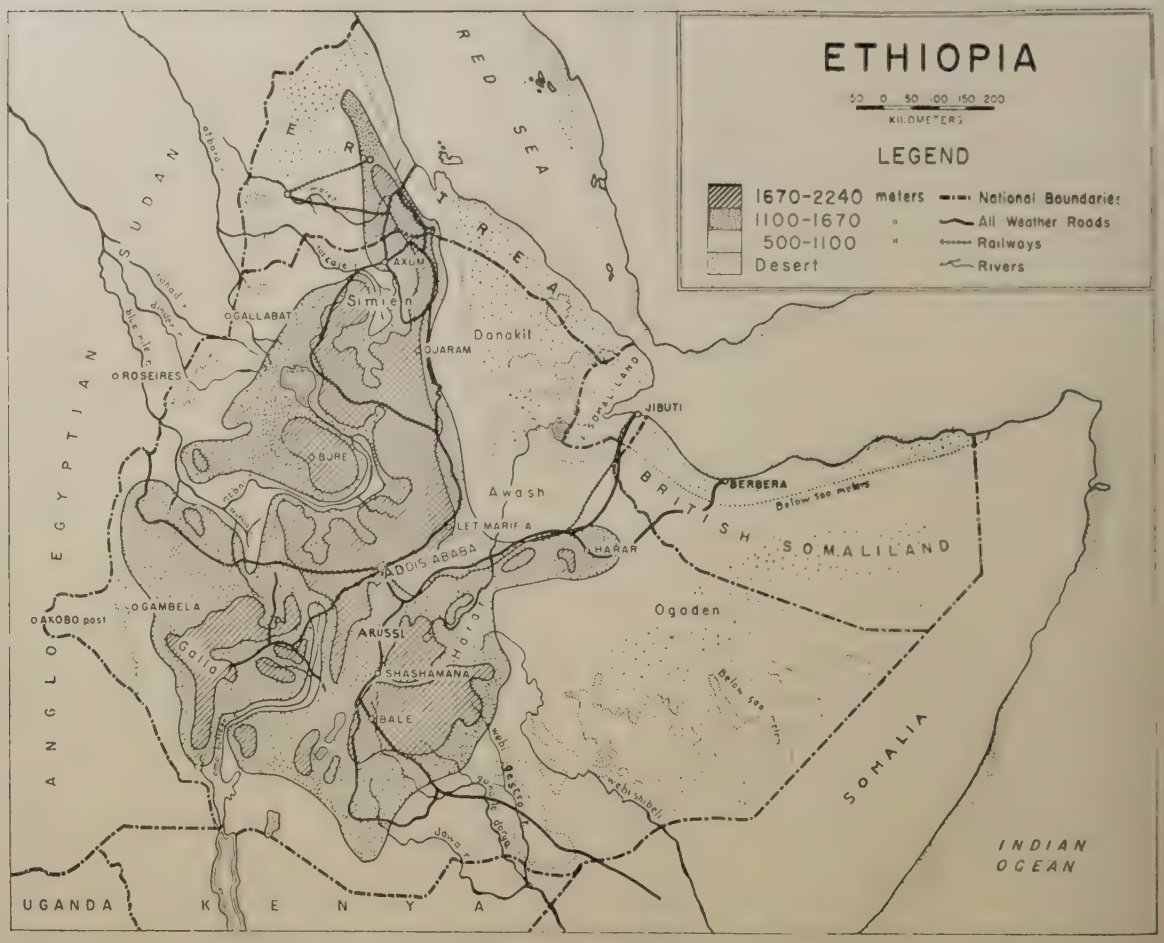
By E.H.F. Swain, FAO Technical Assistance Adviser in Forestry

After a six month's sojourn in Ethiopia one does not speak with authority on forestry for a land as large as France and Germany combined. One can do little more than present an impressionistic sketch of information absorbed and of deductions tentatively reached, and pay tribute to the two preceding pioneers and reporters of forest explorations in this little known country, namely W.E.M. Logan, Assistant Conservator of Forests for the Gold Coast, whilst on war service in Ethiopia, and Glen Russ of the U.S.A. Technical Mission of 1944-1946.

The General Background

Forest conditions are largely shaped by the interaction of men and trees. The elements of the Ethiopian interaction appear to have been as follows.

1. A people, contented and courteous, who have dwelt apart from world influences in highlands of rarefied air surrounded by lowland deserts.
2. The preoccupation of this free and independent people with agricultural and pastoral production, for simple subsistence from red and black soils on which famine and malnutrition are unknown, and which now support about 15,000,000 people.
3. Free selection of land from the outset of colonization, without benefit of surveys or title-deeds; dispossession and changed possession as the outcome of wars; Imperial grants of entailed freehold (*gultrist*) and of unentailed free-hold (*rists*); Imperial leaseholds and tenancies.
4. The tradition that useable trees are "royal trees" belonging to Emperor and Government but not yet registered in written laws and still uncertain of application to *rist* lands.
5. The settlement practice of leaving "royal trees" standing, but of clearing the land around them and burning the trash so that the "royal trees" also succumb.
6. Forest denudation, spreading from the drier north into the moister south, leaving soils stripped of forests, from which the humus has vanished and the surface soils have been washed away.
7. The survival of virgin forests among the hills of the south and south-west, where carnivora, malaria, wars, topography and the general absence of roads have reduced population pressures upon the land, and where the forests are commercially quite inaccessible.
8. The annual clearing by fires on the southern forest fronts, to mark the continuing advance of an agricultural people in pursuit of new farms for old.
9. Traditional satisfaction with local production for local "wayside markets."
10. The relative unimportance, to this indigenous economy, of roads and highways.
11. Historic independence of the world's economy, not significantly affected by the narrow-gauge railway from a political capital across an unproductive desert to a foreign-held port. Trade mainly consists of an exchange of coffee and hides for cotton and paper (which Ethiopia could itself produce), and motor cars and modern goods largely for the governing group and the small foreign population.
12. The dawning of a new era of stationary administration in a permanent capital, superseding a history of shift from center to center in search of fresh stands of trees for fire-wood and building timber for the needs of the Imperial community. This new era was made possible in 1906 by the introduction and planting of *Eucalyptus globulus* on the Entotto hills, whence the stands of native juniper (often called cedar) had been quickly stripped.
13. A still unfinished unification of Ethiopia pending:
    (i) the development of modern roads through difficult country to all parts of Ethiopia;
    (ii) the maturing of administrative organization and the perfection of laws and systems in a new center of Government; and the extension of like organization to the provinces.



14. A post-war Ethiopian renaissance, under the personal inspiration of His Imperial Majesty, Haile Selassie, Emperor of Ethiopia, who has been quick to perceive that the pressures of a multiplying world population oblige Ethiopia to make adequate dispositions for the future.
15. Lingering doubts of modern ideas of economics and of the political systems of the outer world.

This, then, is the background to forestry in Ethiopia. In the face of many difficulties, in the teeth of ancient rights and customs, in a multilingual medium which delays any form of action, the Ministry of Agriculture is attempting, with FAO assistance, to shape Ethiopia's first forest policy out of these diverse elements.

Before, however, one can write the recipe for a forest policy, one has first to study the ingredients, Climates, Forests and Economic Routes.

Climates of Ethiopia

Ethiopia lies near the Equator, at 3° to 18° Lat. N., resulting in warm temperatures with narrow seasonal differences. The country, however, drops to 100 meters below the level of the Red Sea and then lifts sharply to 2,250 meters, to provide a rugged base for mountain peaks some 4,000 meters above the sea. From these mountains the rainfall then creates the torrents which have dissected the rugged base itself by riverine gulfs 500 to 1,300 meters deep.

On this terrain we find a stratification of seasonally narrow climates, modified by regional variations in rainfall resulting, according to the elevation, in everything from torrid deserts up to winter-frosted peaks on which hail-storms take the place of snow.

In none of this series do temperatures of themselves inhibit the development of forests composed of appropriate species. The limiting factor of a country which helps to fill the Nile with water is drought.

The mean annual rainfalls of Ethiopia range from 25 to 2,500 mm., yet what determines the distribution of vegetation is not the isohyet, but the duration of the annual dry season, which may be measured by simply counting the number of months in the year in which the monthly rainfall average is less than 50 mm. or 2 inches.

Thus, Adamitullo and Shashamana, in the Ethiopian Rift, each registers around 600 mm. mean annual rainfall, but vegetation at Adamitullo has to survive six dry months in the year, whilst that of Shashamana must endure seven or eight.

Gambela and Bure, in the rainy south-west, each record a mean annual rainfall of 1,270 mm., but Gam-

bela has five dry months, and Bure only three. The flora of Bure, if called upon to outlast five dry months instead of three, would be much reduced in composition and yield. Gambela and Bure are in different rainfall regimes as well as in different temperature regimes, and each has its own flora frequency. Throughout the country there are many parallel examples of this and it is in fact the length of the dry season which decides the forest distribution. Unfortunately, there are at present only 10 meteorological stations in Ethiopia and these are the sole source of data on climatic conditions. Knowledge of the vegetation and the altitudes must be drawn upon to fill in the details, as for example by considering the distribution of coffee growing.

Coffee is a plant decreed by nature to be a denizen of lands without frost or drought. Of the three commercial species in the world, *C. robusta* and *C. liberica* cannot survive even in the rainiest parts of Ethiopia. *C. arabica* has the most endurance of the three and special strains have been developed for Ethiopia. These strains are only successful (without irrigation) where the number of dry months does not exceed three, and is more than one. Thus, we have the Ethiopian coffee belt climatically defined as below the frost-line of about 2,240 meters altitude, in a rainfall regime of 2-3 dry months.

The Landolphia rubber liane and the broad-leaved trees of East Africa, (but not of drought-free Central Africa) are within this coffee-rainfall regime. But *Juniperus procera* is suited instead to higher, colder and drier elevations, where it puts on an inch of diameter growth in ten years. Between these two extremes, or in the shelters of the lesser heights, grows *Podocarpus gracillior*.

So, despite meagre meteorological data, we can still construct a climatic pattern for Ethiopia-Eritrea, as the basis for consideration of the area's forest problems. This pattern is shown in the accompanying table.

Between coldest and hottest month, the modal range is 5-7 degrees Centigrade. In the dry lowlands, it widens to 8-10 degrees — except in the south-western desert of Ogaden, where the higher winter temperatures narrow it. It reaches its maximum range on the Eritrean Highlands, where summer drought permits the fullest play of sun heat. Elsewhere, the rule is that rains and cloudiness depress the summer thermometer and leave it to the drier spring to provide the hottest month of the year, as the "Ethiopian Summer."

Whilst seasonal differences of temperature are abnormally small differences of temperature between day and night are abnormally great. Judged by day temperatures only, the wet-cloudy summers are colder than the dry winters, and Ethiopians regard the calendar summer as "winter time." But the night temperatures of the calendar winter are low enough to give that season the mean temperature of the coldest month, both on highlands and lowlands.

Ethiopians do not appreciate adherence to the calendar seasons in preference to their own sense of heat and cold, and it must be accepted that exotic trees appear to incline to the Ethiopian view. These are some of the difficulties of understanding the climatic whys and wherefores of the Equatorial Highlands.

Forest Types

If you place your left hand upon the table with the fingers closed and the thumb extended, you have a rough outline of Ethiopia set upon its deserts, and sloping from right to left. The fingers are the northern highlands, the knuckles its peaks, and the interstices the river-cut gulfs. The back of the hand is the southern belt of lowest drought period and of highest productivity. The thumb continues as a bridge to the desert borders of the seaport of Berbera in British Somaliland.

Obviously, the forest climates of Ethiopia are those of this highland hand, with Regime No. 4 of 5 dry months along the fingers and Regime No. 5 of 2-4 dry months on the back. The forests of Regime No. 4 have been reduced to remnants by a thousand years of southward march from Axum. The forests of Regime No. 5 are experiencing the same reduction in the south-east. In the remote and inaccessibile south-west, they linger intact and as yet unused.

Nevertheless, the forests which survive the hand of man in Ethiopia to-day measure approximately 500,000 hectares. That is three times the extent of the high forest of adjoining Kenya, whence exports of manufactured timber of identical East African trees find their way to overseas markets over 600 miles (965 km.) of railway — whilst Ethiopia can export none, for want of access routes.

A number of attempts have been made to classify tropical woody vegetation types. In 1938, T. Burt Davy, mainly on the basis of Indian data, defined six principal types, as follows:

1. High Montane Conifer Forest
2. Upper Montane Rain Forest
3. Lower Montane Evergreen Rain Forest
4. Moist Deciduous Forest
5. Lowland Evergreen Forest
6. Semi-Evergreen Forest

In spite of their 1,300 to 6,300 mm. of mean annual rainfall and their general title of "rain forest," the essential limitation of these six tropical woody vegetation types is their annual drought period.

There is definite correspondence between Davy's High Montane Conifer Forest type (Champion's Dry Coniferous Forest of India) and the type of Ethiopian coniferous forest of Regime 4 (c), with its five dry months and its 700-1,300 mm. of mean annual rainfall. The Ethiopian indicator species are *Juniperus procera*, mixed with *Hagenia abyssinica, Olea chrysophylla, Rhus, Ilex, Allophylus, Bersama* and *Schefflera*. The same *Juniperus* type, with *Olea* and *Widdringtonia*, frequents the 2,000-3,000 meters altitudes of Kenya in an equivalent climatic regime. It is found again towards sea-level in the Union of South Africa far to the south, but drought periods and temperatures again indicate the reasons for its occurrence there, with latitude compensating for altitude.

Regimes 4(a) and 4(b) of Ethiopia have similar temperatures to those of Davy's Lower Montane Evergreen rainforest, but their diminished rainfalls and doubled drought period exclude his wood vegetation type. Regime 5 (a), however, admits it, but with reduced mean annual rainfall.

CLIMATIC REGIMES IN ETHIOPIA

Area	Altitude (m.)	Mean Temperatures Cold Months °C	Mean Temperatures Hot Months °C	Mean Annual Rainfall mm.	Number of Dry Months
1. Regimes of 11 - 12 dry months					
(a) Ogaden Desert (S. E. Ethiopia) . . .	300 - 1 000	24 - 29	29 - 34	50 - 125	12
(b) North-western Eritrean Uplands . .	300 - 1 670	23 - 28	32 - 36	50 - 200	12
(c) Eritrean and Danakil Coastal Deserts	0 - 1 000	21 - 26	31 - 36	25 - 200	11
(d) Awash Desert	1 - 1 000	20 - 24	29 - 33	150 - 250	11
2. Regimes of 8 - 10 dry months					
(a) North-west (Sudan) Slopes of Ethiopia	500 - 1 000	23 - 26	30 - 33	400 - 650	8
(b) Low Somali Slopes (S. E. Ethiopia) .	1 000 - 1 670	19 - 23	24 - 28	250 - 500	8
(c) Eritrean Highlands	1 000 - 1 670	18 - 22	28 - 33	350 - 500	9 - 10
(d) Eritrean Highlands	1 670 - 2 240	16 - 18	21 - 27	500 - 750	8 - 9
(e) Eritrean Highlands	2 240 - 3 000	8 - 16	14 - 20	450 - 550	10
3. Regimes of 6 - 7 dry months					
(a) West (Sudan) Slopes of Ethiopia . .	500 - 1 000	23 - 27	30 - 34	800 - 1 000	6 - 7
(b) Rift and the Harar Escarpment . .	1 000 - 1 670	17 - 22	24 - 29	500 - 800	5 - 7
(c) Low Somali Slopes of S. E. Ethiopia .	1 000 - 1 670	17 - 20	24 - 27	500 - 600	6 - 7
(d) North-east Escarpment of Ethiopia .	more than 2240	11 - 13	16 - 18	1 000 - 1 500	6
4. Regimes of 5 dry months					
(a) Harar Tableland	1 670 - 2 240	16 - 19	19 - 22	750 - 1 000	5
(b) North-west Highlands of Ethiopia .	1 670 - 2 240	14 - 17	20 - 22	1 200 - 1 450	5
(c) North-east Highlands of Ethiopia . .	2 240 - 2 760	13 - 15	18 - 19	700 - 1 300	5
(d) South-west (Sudan) Slopes of Ethiopia	500 - 1 000	22 - 26	28 - 31	850 - 1 300	5
5. Regimes of 2 - 4 dry months					
(a) Galla Highlands	1 670 - 2 240	17 - 19	22 - 26	1 300 - 2 000	2 - 4
(b) Arussi-Bale Highlands	1 670 - 2 240	—	—	1 200 - 1 750	2 - 3
(c) Arussi-Bale Highlands	more than 2240	—	—	1 200 - 1 750	2 - 3
(d) Eritrean Escarpment	500 - 1 000	18 - 20	20 - 31	700 - 900	3
(e-f) Eritrean Escarpment	1 000 - 2 240	—	—	—	—
(g) Eritrean Escarpment	2 240	13 - 14	20 - 21	1 000 - 1 200	3

A drought prolongation and diminished rainfall changes Davy's Lower Montane Evergreen Forest into his Moist Deciduous forest, as represented by the Teak and *Terminalia* Forest of India and the Padauk of the Andamans. That section of the Ethiopian Regime's No. 5 (a) of highest rainfalls and least drought period, however, barely admits this type — excluding the deciduous trees and converting the type to his Lowland Evergreen Forest, as recorded for India and Ceylon from sea-level to 900 meters.

Davy's Semi-Evergreen Forest is only a differentiation of his Lowland Evergreen type, registering the period of inadequate soil moisture. It exists as an ecotone between closed forest and parkland, or as a connecting link between moist deciduous and dry tropical forest. Regime 4 (d) of Ethiopia approximates to Davy's Semi-Evergreen forest, but it is hotter and drier, with corresponding effect upon the indigenous woody vegetation.

Davy's High Montane Rainforest approximates to the Temperate Rainforest of Shantz and Marbutt, who, however, group *Juniperus procera* and *Podocarpus gracilior* forests together. Yet both are Drought Period forests. The Tropical Rainforest of Shantz and Marbutt, recorded for the Ivory Coast and the Cameroons, has no place in Ethiopia, because Ethiopia has no such moist climatic regime.

W.E.M. Logan applies the name of Tropical Upper Montane Rainforest to both the Ethiopian *Podocarpus* forest and to the Ethiopian broad-leaved forests of regime 5 (a) combined. He uses the High Montane Conifer Forest type of Davy for the *Juniperus* forests, but precedes it with the adjective "tropical," though the type extends from the Sudan edge of Northern Eritrea southwards to Cape Province.

Glen Russ dismisses all the extant rainforest classifications as incompatible with the forest types of Ethiopia and adopts, instead, the differentiations:

1. Coniferous Mixed Forest
2. The Broad-Leaved Forests of the South-west and West
3. The Gallery Forests

This is a simple and direct classification, but oversimplified.

All these classifications lack essential correlation with their climatic regimes, of which their forest types are true vegetational expressions. Nor would I, at this stage, wish to attempt this fundamental but complex task for a territory where climates are confused by a complicated topography.

It does not take long to perceive, however, that *Juniperus procera* can tolerate five dry months per annum on the thin-soiled, frosted backbones of Ethiopia, and that this Temperate Mixed Juniper Forest deserves distinction from the Temperate Mixed *Podocarpus* Forest which Glen Russ groups with it.

Podocarpus gracilior cannot ascend the hard heights of the dry hills nor reach the desert edges, nor can it spread as far north or south as *Juniperus*. Its growth-rate is almost as slow, but its drought-resistance is lower. It seeks a milder habitat and the companionship of less hardy broad-leaved species. It finds its place in lower, sheltered vales where it is joined by the more venturesome broad-leaved trees of the narrow drought period regimes, such as *Ekebergia ruepellianum, Celtis kraussianum, Olea hochstetteri, Syderoxylon acantha* and *Apodytes*. Though the *Podocarpus* vales interlace with the *Juniperus* hill-crests, and though both species mingle at the margin (but with *Podocarpus* always sheltering under the *Juniperus*) their characteristics, and habitats and types are different.

The Temperate Mixed *Podocarpus* Forest is really the link between the Temperate Mixed *Juniperus* Forest and the Sub-Tropical Broad-leaved Forests of the 2-4 dry months climatic regime — a type which Logan styles the *Pouteria-Albizzia* Association of his Tropical Upper Montane Rainforest, and which Russ disposes of as the Broad-leaved Forests of the South-west and West, of the Ethiopian Highlands.

Between them, they record for these broad-leaved forests the following timber trees with no Central African species among them:

Pouteria (Sersalina) ferruginea
Albizzia schimperiana
Sapium ellipticum
Allophylus abyssinica
Gallineria coffeoides
Schefflera abyssinica
Dracaena steudneri
Polyscias ferruginea
Milletia ferruginea
Teclea nobilis
Maesa lanceolata
Pygeum africanum
Ficus sp. (at their optimum)
Cordia abyssinica
Croton microstachya
Mitragyna sp.
Erythrina sp.

It is the forest types of the forest climates cited above, which give to Ethiopia its now man-reduced forest area of 500,000 hectares; an area which yet might be doubled by reforestation.

These, however, do not exhaust the forest potential of Ethiopia. Climatic Regime 3, which registers 6-7 dry months per year, is the habitat of Logan's Tropical Savannah Woodland, Russ's High Grass Savannah, or Shantz and Marbutt's Tropical Dry Forest. Annual grazing fires have degraded this dry forest type, reduced its constituent species to the most firehardy and widened their spacing to that of an orchard. The surviving species are of such genera as *Combretum, Terminalia, Schrebera, Zizyphus, Syzgium, Lonchocarpus, Iannea, Faurea, Stereospermum, Gardenia, Cussonia, Hymenodicton, Hauswolfea, Gymnosporea, Acacia, Vitex Ehretia, Bauhinia, Protea, Grewia* and *Dodonea*. The last seven genera are represented in Australia in an equivalent climatic regime.

Given fire-protection and a sand-mulch, the Australian *Callitris glauca*, cousin of the East African *Widdringtonia*, could make a forest stand here. Several Australian Eucalyptus could also distinguish themselves; thornless Australian *Acacias* would find themselves at home — more so than *Acacia senegal*, the producer of gum arabic which flourishes in the 6-7 dry months zone of Eastern Sudan, with 650 mm. mean annual rainfall on black, cracking clays, or 450 mm. on sand (and provides the Sudan with 20,000 tons of exports per annum).

The latter species, however, demands a higher summer heat than most of the Ethiopian 6-7 dry months regime affords. It reappears therefore on the coastal and lakeside lowlands of Kenya where it can keep warm enough to make gum arabic — yet with enough dry months to exude its gum from its cracking bark.

Russ describes this dry forest type as the most widespread of Ethiopia, covering half the country. It develops below the high forests, and descends the slopes, through lengthening drought periods, until it has to give place to Russ's Desert Acacia Savannah, Logan's Tropical Thornland, or Shantz and Marbutt's Thorn-Forest — where the dry months range from eight to eleven per annum, and the forest potential of Ethiopia comes to its end in perennial drought.

Exotics

Thus we get a glimpse of Ethiopia's forest situation. The behavior of exotics throws more light on the subject.

Towards the end of the last century Menelik II brought his court to that place where his empress thought to build the "City of the New Flower" in the shadows of the broad, high hills of Entotto. Those hills were thick *Juniperus-Podocarpus* forests and gave promise of wood provision for all time to those whom forest denudation had driven out of the place from which they had just come.

Menelik II thought to make assurance doubly sure by re-declaring, as oral law, the ancient tradition of imperial ownership of full grown trees. He failed to realize that this could be insured only by safeguarding the younger trees to maturity. Thus, he missed becoming the founder of Ethiopian forest policy. He permitted the continuance of clearing younger trees for cultivation, and they in turn provided the fuel for the fires which brought both Imperial trees and Imperial law to nothing.

The Entotto hills became completely stripped. It appeared that the gardeners of this "City of the New Flower" would be expelled once more from their would-be Eden to seek wood in the underlands of Galla.

At this juncture there arrived M. Mondon-Vidaillet, a French forester, with seeds of Australian Eucalypts. One of them was a tough tree from the hard Australian hills, accommodating enough to take both winter and summer rainfalls in its stride, as well as snow. It grew prodigiously. It was planted at 20,000 per hectare, and thinned for its produce in the fourth, seventh, fifteenth and twenty-fifth years. The 800 trees left per hectare had a standing volume of 570 cubic metres in the 26th year and 1080 cubic meters in the 40th.

The thinnings gave staves for fences, slim sticks for wattle and daub *toukouls*, and finally, tall poles for the scaffolding of the Imperial masonry. There was also firewood in plenty, even to the bales of foliage lumbered to the *toukouls* for the cooking of the *ingera* pancakes of the people.

Anyone who wanted to make good his future planted a plot of this *Bahaar Zarf*, this "Strange Tree from across the Sea." Now, forestry is the chief industry of the environs of the capital city of Addis Ababa with its 300,000 population. On any market day, you will see the forest owners converging on the city, and on their backs and heads and overwhelming their tiny donkeys, the produce of their investment. They provide 90 percent of the market traffic. All this is owed to one species of tree.

Now, there are others on trial. *Grevillea robusta* flaunts its sprays of old gold in the dry Ethiopian autumn, similar to the dry Australian springtime. The Australian blackwood gum grows with the Australian blue Gum; the Australian black wattle of the tanneries flourishes as do the *Casuarinae*. Mexican, Californian and Mediterranean Cypresses thrive, although the sudden drought period mortally splits the bark of weaklings. A Norfolk Island Pine grows strongly, and you may see the Californian *Pinus radiata* top-blighted by the north-east winter heat on the hard hills, yet thriving in sheltered valleys.

The significant thing about these exotic successes is that they all came from drought period habitats, and have had to survive the primitive techniques of sowing in February at the scant commencement of the rains and open-root planting six months later in the deluges that herald the long drought from October back to February again.

With a more scientific approach and techniques, therefore, Ethiopia might well come to be able to grow a vast new forest estate.

Conclusion

It does indeed seem from a cursory survey that Ethiopian forests might provide means of development of the country's economic life. An obvious first step forward is the diversion of trained youth into the creation of a forest service and forest industries. There is still, however, a lion in the path of such a forest policy, and, indeed, in the path of the entire Ethiopian Renaissance. No country was ever developed except along with economic transport routes.

Neighboring countries have had to do it, and Ethiopia can do it — and more profitably, because no neighbors ever had such a continuous belt of potential productivity through which to project its main road to development.

Commodity Report

Wood Pulp

This report gives some highlights of the developments in wood pulp production, trade and prices in 1951 and indicates what the future looks like at the beginning of 1952. It contains information only on North America and western Europe, but since these regions together at present account for over nine-tenths of the total world production and consumption of wood pulp, this coverage is sufficient to show the main trends.

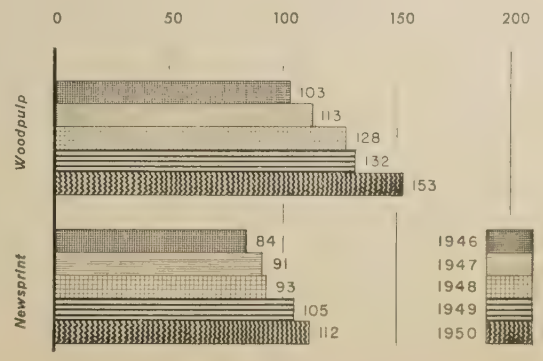
World production of wood pulp in 1950 is estimated at about 32.6 million metric tons, 16 percent greater than in the previous year, but the bulk of the pulp produced is consumed in North America and Europe, and a slight or even considerable improvement of the supply situation in these regions does not necessarily alleviate to any significant extent the shortage in many other parts of the globe. Moreover, there are, even within the most important pulp producing regions, noticeable differences between countries in actual consumption of products. This is illustrated by the following figures from the most recent FAO *Yearbook of Forest Products Statistics* showing per caput consumption of pulp products, in terms of pulp equivalents, in certain countries during the year 1950:

	Kg. per caput
United States	120
Canada	82
Sweden	78
Finland	68
Norway	65
France, Austria and Germany	30-35

In Africa, Latin America, the Far East, and notably in New Zealand, several important programs have now been started and projects blueprinted for the increase of pulping capacity. The FAO Expanded Technical Assistance Program is giving impetus to the planning of new undertakings in various countries where adequate, but more or less unexploited resources are available. In fact, FAO was requested at its 1951 Conference to survey the possibilities for increasing the production and transportation facilities of pulpwood, while the Member Governments were urged to take action to increase pulpwood supplies, to consider establishing or encouraging new pulp and paper industries, and to request from FAO, under the Expanded Technical Assistance Program, expert missions to help them in these matters.

It will, however, be some years before most of the projects now started or contemplated begin to show effective results, and in the meantime, untapped resources are being opened up also in North America and Europe. For instance, the exploitation of the huge forests of Alaska and Labrador is on the horizon. There exist in Finland alone possibilities for expanding the capacity of the pulp industry by at least 370,000 tons of chemical pulp per year; in a number of European countries pulp production will be increased by greater utilization of hardwood species and low-grade wood. Sweden already appears to derive one-third of its raw material for pulp manufacture from logging and conversion "waste." The relative importance of fibrous raw materials other than wood, such as straw, bagasse and esparto grass, is also growing in many parts of the world.

Woodpulp and newsprint production trends (1937:100)



The above chart, which is derived from the Yearbook of Forest Products Statistics *for 1951, shows the trends in woodpulp and newsprint production in post-war years. Only the situation in the major producing countries is shown.*

North America

Canada

Production

New capacity was also brought into operation in Canada during 1951. According to the United States Pulp Producers' Association, the total capacity of Canada's pulp industry was supposed to increase from about 8.1 to almost 8.5 million tons.

The results of expansion and modernization were apparent in production figures. The monthly average production for all pulp over nine months of 1951 was

9 percent higher than that for the whole year 1950, and production during this period totalled more than 80 percent of the 1950 figure, indicating that total output in 1951 would probably be in the neighborhood of 8.2 million tons. Increases in the production of chemical pulp were proportionally higher than in the output of mechanical pulp.

The sulphur shortage which prevailed all over the world and was felt more seriously in Canada than in the United States, was eased by allocations made by the International Materials Conference at Washington. Canada's own production of sulphur is growing, but may still not suffice to cover total requirements within the immediate future.

Exports

Exports of Canadian wood pulp were greater than ever during the first eight months of 1951. Shipments to the United States were then 15 percent higher than a year before and exports to other destinations, which were at a low level in 1950 and still only represented about one-sixth of total exports, jumped by 230 percent. Both chemical and mechanical pulp exports increased, except for exports of bleached sulphite to the United States which declined very slightly.

It is important to note that the increase over the same period of 1950 of Canada's total pulp exports during January-August 1951 was almost 88 percent in terms of value against about 12 percent in terms of volume. Incidentally, the value of pulpwood exports increased by more than 100 percent.

United States

Production

A large amount of new pulping capacity has been put into operation. According to figures released by the United States Pulp Producers' Association, the total theoretical capacity of the country's pulp industry was to be increased from about 14.7 million tons in 1950 to well over 15.9 million tons in 1951, as a part of the huge program of expansion and modernization already started on a moderate scale in 1946/47 and expected to continue through 1952.

The expansion of industry is being carried out not only in the most important pulp-producing regions in the Lake States and the West but also in the Southern States. In some places there has been a significant rise in the use of hardwoods as a part of the raw material. One interesting feature was the plan to double from 300 to 600 tons daily the capacity of the new dissolving pulp mill at Natchez, Miss., which started operations in 1950 and was the first plant to adopt the newly developed sulphate process using hardwoods in the manufacture of dissolving pulps.

Very little of the increased capacity was planned in mills producing for the market, and therefore it was believed that the requirements of non-integrated paper mills, i. e. those which are dependent on market pulp, were still not being met. Another feature of the expansion carried out so far is that while there are big increases in the sulphate group, the sulphite capacity seems to have remained practically stable.

During the first half of 1951 considerable increases in the production of all grades, with the exception of soda pulp, were registered. Bleached and semi-bleached sulphates, paper grades, were about 27 percent, and dissolving and special alpha pulps about 30 percent above the levels for the first six months of 1950.

Aggregate production of all grades during the first half of 1951 totalled about 7.5 million tons, which was almost 17 percent above the corresponding figure for 1950.

During the latter half of the year consumption showed some decline and by mid-November a slow but steady increase in total stocks held by producing and consuming mills was noticed. The main factor causing this change was an easing on the paper markets in the autumn, a situation which seemed to foreshadow a considerable surplus production of paper. In November and early December output of paper declined somewhat below the theoretical capacity of paper mills, which is actually 10 percent lower than the real capacity. One week before Christmas the production of paper was 96.1 percent of theoretical capacity. The decline in the output of all paperboards was still more noticeable and had started earlier, being in September 86 percent, and in November 82 percent, of theoretical capacity. On the other hand, newsprint production was very high in October, and output for the first ten months of 1951 was 9.1 percent above the corresponding 1950 figure.

Under such conditions output of pulp regressed somewhat from the peak levels reached earlier in the year. Nevertheless, the over-all rate of output was not greatly affected by the relaxation of the markets and, according to early estimates, the United States' total production of pulp in 1951 attained the high figure of around 15 million tons, about 12 percent above the 1950 level.

Trade

Imports of wood pulp during the first half of 1951 were somewhat above the levels of a year earlier; Canadian imports had increased by about 14 percent to account for 77 percent of the total. By the end of August total imports had reached about 1.5 million tons, 6 percent higher than a year earlier.

Imports from some European countries were affected by the ceiling prices to which reference is made later. Total receipts of European pulp during the first eight months were 25 percent below the 1950 figure. By that time imports from Sweden had dropped to about 183,000 tons which represented a decline of 34 percent from the previous year, but those from Finland had fallen only slightly and those from Norway had in fact increased. The same development continued during the next two months, and by the beginning of November 1951, total imports from Europe had reached only 385,000 tons compared with 521,000 tons a year earlier. Purchases from Finland and Norway continued at a normal pace.

According to early estimates, total wood pulp imports during the whole year 1951 amounted to about 2.09 million tons, slightly less than the 1950 figure of 2.16 million tons. While imports from Canada showed an increase, those from Europe dropped. Pulp receipts from Sweden decreased by 35 percent compared with 1950, and imports from Finland by 11 percent, whereas imports from Norway slightly increased.

United States pulp exports represent very marginal quantities compared with the volume of production and of imports. In 1950 exports were about 5 percent of the volume of imports for the same year, but during the first half of 1951 total pulp exports were relatively high, over 95,000 tons, and had already exceeded the volume for the whole year 1950. Greatest increases were recorded in exports of unbleached sulphate and unbleached sulphite. Export quotas of unbleached sulphate in the third and fourth quarter of 1951 were fixed at 25,000 short tons each, while the quota for dissolving and special chemical grades was 7,000 short tons in each of the two quarters. Quotas for bleached and unbleached sulphite and bleached and semi-bleached sulphate were 7,000 short tons during the last quarter of the year. If the quotas were fully used, total exports during 1951 ought to have been more than double the 1950 quantities.

Prices

After the upward movement in pulp prices all over the world during 1950, wide differences appeared between various markets, and also in prices quoted on one market for pulps originating from various sources. Thus, at the beginning of 1951, there was an unusually large gap between the prices for North American and Scandinavian pulp on the United States market. While domestic bleached sulphite had risen from $118 per short ton, delivered, in the first quarter of 1950 to $135 a year later, i. e. by only 14 percent, Scandinavian unbleached sulphate, for instance, rose during the same period from $82.50 to $162.50 per short ton, on dock, or by 113 percent.

A price freezing order for domestic pulps, was issued towards the end of January 1951. During the subsequent months the disparity between prices for domestic and imported grades became more marked, particularly after Swedish prices were increased in the second quarter. Second quarter contract prices for bleached sulphite, for instance, compared with prices for domestic production were as follows (per air-dry short ton): United States production $135 to $145; Canadian production $160 to $175; Finnish $225, on dock, and Swedish $250 to $290, on dock. At the beginning of July, a price ceiling, with the Finnish price level as basis for imports from Europe, was introduced. Import prices were fixed at $200 for all unbleached cellulose, $225 for bleached sulphite and $230 for bleached sulphate, all per short ton on dock.

In general, prices for Canadian production have been $15 to $25, and more in the case of bleached sulphate, above the prices for domestic pulps. On the other hand, ceiling prices for European pulps have been $50 to $70 higher than prices for Canadian pulps on the United States market. The main reasons for this difference in favor of overseas pulps were, first, considerations of quality and, second, the difficulties anticipated by non-integrated and semi-integrated paper mills, depending completely or partly on market pulp in getting sufficient supplies.

Although the ceiling prices for overseas pulps led to diminished supplies from Sweden, the market pulp situation in fact seemed to remain satisfactory throughout 1951. When the tension that had prevailed earlier in the year lessened in the autumn, prices also began to show some signs of softening. By mid November it was uncertain whether all quantities of certain grades of domestic market pulp available at that time could be disposed of at ceiling prices. This was particularly true of some kraft pulp brands. As a consequence, there was again, towards the turn of the year, some speculation about the possibility of a downward adjustment of ceiling prices for European pulps.

Outlook for North America

The capacity of the pulp industry both in the United States and Canada is scheduled to expand further in 1952. Theoretical capacity is supposed to reach roughly 16.8 million tons by the end of the year in the United States and about 8.7 million tons in Canada, making the aggregate capacity in North America by the beginning of 1953 1.1 million tons greater than in 1951. Already there is talk that, in particular, newsprint supplies will soon catch up with effective demand.

However, requirements for defence construction will probably delay release of the materials required for expansion of the industry, and it is believed that the full pace may only be restored during the latter half of 1952.

Europe

Production

The strong demand for wood pulp resulted in increased pulpwood fellings in some countries, and in changes in the international movement of pulpwood. Exports of pulpwood from Western Germany dropped to almost zero in 1951, and exports from Poland, Yugoslavia and Sweden were diminishing. On the other hand, exports from Finland during the first six months of 1951, were up by almost one-third over the quantity for the same period of 1950. By the end of August 1951 Finland's exports of pulpwood amounted to 2.14 million cubic meters, as against 1.25 million a year earlier, and for the first eleven months of the year reached 3.28 million cubic meters or about 75 percent more than for the whole of 1950. With the exception of unknown quantities shipped from Eastern European countries to the U.S.S.R. and the increased Finnish exports to the same destination, practically all European pulpwood exports went to countries within the region.

During the first half of 1951, Western Germany, Italy, Norway, and the Netherlands increased their pulpwood imports considerably, the first receiving pulpwood from Canada for the first time, while the Swedish supply situation was improved by both increased purchases from Finland and diminished exports. Pulpwood imports from Canada were of signficance to the United Kingdom. France also received certain quantities of Canadian pulpwood.

Although imports of pulpwood by European countries had reached about 1,122,000 cubic meters by the end of June 1951, as against about 766,000 cubic meters a year earlier, requirements were still a long way from being met.

The main importing countries were also reported to have stepped up their own pulpwood output, in some

cases very successfully. However, the competition for roundwood not only with sawmills but also with pitprop producers was felt very strongly.

Production of wood pulp was, at times, threatened by shortages of electric power, fuel and sulphur, but with the exception of a temporary slowing down or interruption in the output of mechanical pulp due to a drought period in some countries, these shortages did not appear to have very serious effects on the European pulp industry.

Final figures on the production of wood pulp in different European countries during 1951 are scanty at the time of writing. There are, however, indications supporting earlier predictions that the 1950 totals, estimated at about 5.7 million tons of chemical pulp and about 3.3 million tons of mechanical pulp, were reached and possibly exceeded. This achievement would have been due more to the relatively long period during which high prices prevailed, enabling pulp manufacturers to compete effectively on the round timber market, rather than to increases in pulping capacity, of which a part has actually been lying idle in a number of countries during the last few years.

On the whole, the year 1951 was favorable for pulp production in the three northern countries.

Finland. Capacity was increased and a plant for the manufacture of semi-chemical pulp came into operation during the year. Output of chemical pulp ran well ahead of the previous year's levels and reached, for the whole year, 1,385,000 tons compared with 1,194,000 tons in 1950. Production of sulphate pulp, which accounted for roughly three-sevenths of the total, rose more than that of sulphite; output represented a postwar record and was only a little below the theoretical capacity of the industry.

Production of mechanical pulp was for some months affected by shortages of water and electricity. Nevertheless the year's total was 807,000 tons as against, 719,000 tons in 1950.

Sweden. Sections of the pulp industry suffered from shortages of fuel and, particularly, timber. The shortage of pulpwood experienced in some areas of the country during the past few years has been overcome by resort to special arrangements. For instance, the province of Norrland, in northern Sweden, has severely felt the lack of roundwood and the pulp mills have not only been forced to ship additional quantities of pulpwood from the southern parts of the country and to import supplies from northern Finland, but also to use pine and spruce timber of both larger and smaller dimensions than has been customary. Moreover, the importance of hardwoods in pulp production has been increasing; it is reported that one of the largest sulphate mills in the Norrland province used birch and aspen for about 40 percent of its 1951 production.

During the first half of 1951 production of chemical pulp in Sweden attained a volume of 1.25 million tons, or 8 percent over the corresponding period of 1950. The figure for the first three-quarters of the year was still 6 percent above 1950 levels, and according to early estimates the production for the whole year 1951 was over 2.5 million tons, thus exceeding the 1950 total of 2.46 million tons.

No final information as to the 1951 production of mechanical wood pulp is yet available. As the industry was not too seriously affected by the summer drought, it was expected that output might exceed the 1950 figure of 685,000 tons.

Norway. Supplies here had to be largely augmented by imports from Finland and Sweden, as well as by more extensive use of small-size domestic timber. Mills manufacturing chemical wood pulp ran at about 85 percent of capacity, and recent estimates put the output for the total year at around 520,000 tons, the highest annual figure since 1937, as compared with 483,000 tons in 1950.

The manufacture of mechanical pulp had to cope with shortages of water and electric power during the first half of 1951, but later the situation improved and the leeway was made up. It was anticipated that production for sale would reach the quantity planned for the year, about 365,000 tons dry weight, a little more than in 1950.

Germany. The Federal Republic, the biggest producer on the European continent, was in 1951 much better supplied with pulpwood than a year earlier. During the forestry year 1949/50 domestic supplies of pulpwood amounted to 1,674,000 cubic meters, solid measure without bark, and imports to 460,000 cubic meters; the figures for 1950/51 were 2,290,000 and 814,000 cubic meters respectively. Pulpwood requirements, which have increased threefold during the past four years, were met in part by maintaining a slight price differential between pulpwood and pitprops, in favor of the former. On the other hand, industrial activity was threatened by a shortage of coal.

The production of chemical pulps in western Germany was running at an average monthly rate of 47,000 tons during January-October 1951, which was 13 percent higher than the monthly average for the whole year 1950. Output of wood pulp for the manufacture of paper was 8 percent above the ten-month period of 1950, while the production of dissolving pulps, corresponding to slightly more than one-fourth of total pulp output, increased by about 33 percent. The proportion of pulp made from straw was 6.6 percent of total pulp production. According to early estimates total production of chemical pulp in the Federal Republic of Germany was over 560,000 tons for the total year 1951, as against 469,000 tons in 1950.

France. The Monnet Plan of 1946 for the extension of industry provided for the development of pulping capacity from 485,000 tons in 1947 to 746,000 tons by 1951. Due to financial difficulties and the fact that consumption of paper and paperboards did not increase at the pace anticipated, the program has only partially been carried out. The total capacity of the country's pulp industry was in 1950 about 540,000 tons and in 1951, 619,000 tons, including 245,000 tons of mechanical pulp and about 76,000 tons of straw pulps. The manufacture of pulp from hardwoods, which was negligible in 1948, was estimated for 1951 at a capacity of 41,000 tons. During the year the capacity for pulping of hardwood was expected to increase by 23,000 tons and the capacity for the use of straw by 41,000 tons.

Pulpwood was a major source of concern in 1951, since supplies from the forests in the French occupied zone in Germany had come to an end and the extra quantities of pulpwood resulting from the forest fires of 1950 had been used. Imports from Finland and North America were stepped up, and during the first half of the year exceeded the corresponding 1950 imports by almost one-third. Nevertheless, it was estimated that towards the end of 1951 there was a deficit of about 420,000 steres or roughly 315,000 cubic meters of coniferous pulpwood, only a part of which could be covered by the available poplar pulpwood, estimated at 200,000 steres.

It was expected that the production of mechanical pulp and of chemical grades made from conifers would show no substantial increase in 1951, but a considerable rise in the manufacture of pulps made from hardwoods and straw was anticipated. During the first eight months of 1951 total pulp production was about 18 percent above the corresponding period in 1950; output of mechanical pulp was then 15 percent ahead of the January-August 1950 figure. At the time of writing, no information is available as to whether the high 1950 output of all pulp, 566,000 tons, was exceeded. It had been feared that the shortage of sulphur would seriously affect the output of sulphite pulp.

Austria. The industry's capacity in 1950 was about 100,000 tons of mechanical pulp and around 280,000 tons of chemical pulp. Production figures for that year, over 93,000 tons and 250,000 tons respectively, came close to the theoretical capacity level. The year 1951 brought difficulties from the increasing prices of pulpwood. During the first five months of the year, production of mechanical pulp was about 42,000 tons as against 36,000 tons a year earlier, and production of chemical pulp 109,000 tons as against 100,000 tons in 1950, giving an overall increase of about 11 percent.

Italy. A little more chemical pulp than mechanical pulp was produced, and in 1950 total production consisted of 128,000 tons of mechanical and 138,000 tons of chemical pulp. In 1951, Italy was able to increase pulpwood imports, particularly from Finland, and during the first half of the year these amounted to over 197,000 cubic meters, as against 156,000 cubic meters a year earlier. Consequently the pulp industry operated at a higher rate than a year before. During the first eight months of 1951, production of mechanical pulp was running 13 percent, chemical pulps for the manufacture of paper 46 percent, and the output of textile pulps — which account for a little less than one-third of all chemical pulp — 22 percent above the levels for the corresponding period of 1950. Output of semi-chemical pulp, representing only about 3 percent of total pulp production, was 36 percent over the January-August 1950 level.

Exports

While it is still not possible to get a clear picture of the development of European pulp trade in 1951, it seems possible that the 1950 export volumes were exceeded.

Sweden. According to early estimates, exports of chemical pulp were 1.71 million tons, compared with 1.81 million tons the previous year. The decrease was largest in unbleached sulphite and unbleached sulphate (totalling 908,000 tons as against 1,008,000 tons 1950), while increases in the exports of dissolving pulp and bleached sulphate were balanced by the drop in exports of other bleached sulphate. On the other hand, exports of mechanical pulp showed an increase from 283,000 tons in 1950 to 297,000 tons in 1951.

Equalization duties on exported pulp were introduced at the beginning of the year, and were later raised substantially. Export shipments were accelerated before the higher equalization duties and the United States ceiling prices for European pulp came into effect on 1 July. Thus, in June 319,000 tons of pulp were exported, 50,000 tons going to the United States, as compared with 195,000 and 21,000 tons respectively in June 1950. During the latter half of the year, activity slackened; although shipments to the United States did not completely stop, they were considerably reduced. For the January-October period, the 168,000 tons shipped to the U.S.A. accounted for almost 12 percent of the total exports of chemical pulps.

The United Kingdom was the biggest single customer for Swedish pulp, and during the ten months period took about 151,000 tons of mechanical, over 327,000 tons of chemical pulps, corresponding to 61 and 23 percent of Sweden's total exports, respectively. Figures for the whole year 1950 were 180,000 and 420,000 tons. The amounts exported to some Latin American countries during January-October were also significant; over 64,000 tons of chemical pulp went to Brazil and about 47,000 tons of chemical and 17,000 tons of mechanical pulp to Argentina. There was also a noticeable increase in exports of chemical pulp to Japan.

The reduction in Swedish exports to the United States during the latter half of the year (in the third quarter of 1951, shipments were only 30,000 tons as against 70,000 tons a year earlier) seemed likely to result in increased imports to European markets. On the other hand, owing to the position of the balance of trade with Argentina, the Swedish authorities refused after the end of April to issue new licenses for export of wood pulp to that country, and there was a standstill in sales until a scheme for equalizing the costs of exports and imports was adopted in mid-December.

Finland. Wood pulp exports in 1951 exceeded those for the previous year; the total quantities were 982,000 tons of chemical pulp, compared to 886,000 tons in 1950, and 210,000 tons of mechanical pulp as against 177,000 tons a year earlier.

No definite information on the distribution of 1951 Finnish exports is available at the time of writing. According to British import statistics, the quantity of Finnish mechanical pulp arriving in the United Kingdom during the first ten months of 1951 was 37 percent higher than a year earlier, and only a little below the 1950 total of 103,000 tons. Imports of chemical pulp were 24 percent higher than a year before and similarly, at 300,000 tons, very close to the whole 1950 figure of 322,000 tons. Shipments of Finnish wood pulp to the United States were not affected by the introduction of ceiling prices, and exports of chemical pulp were

expected to reach around 175,000 tons for the year, as against about 170,000 tons in 1950.

Norway. Pulp exports during the first half of 1951 appeared to be at a slightly lower level than a year before. By the end of June, chemical pulp exports stood at 122,000 tons and mechanical pulp at 150,000 tons, as compared with 123,000 and 157,000 tons respectively during the same period in 1950.

Germany. (Federal Republic). During the first six months of 1951 shipments of all pulps were over 49,000 tons, against 26,000 tons a year before. The trend continued later in the year, and for January-October the monthly export average was 5,500 tons, compared to 4,700 tons in 1950.

Austria. Exports of chemical pulp in the first half of 1951 were about 52,000 tons, slightly less than in 1950.

Imports

European pulp imports during the first six months of 1951 appear to have been larger than a year earlier, notwithstanding the fact that receipts by Germany and Italy decreased. Later in the year imports to Germany increased considerably.

United Kingdom. The largest single importer in Europe, the U. K. considerably increased imports of all grades of pulp. Totals for the period January-November 1951 show imports of chemical pulp at about 922,000 tons, as against about 784,000 tons during the same months of 1950 (948,000 tons for the whole year); for the same period imports of mechanical pulp were over 462,000 tons, as against about 416,000 tons a year earlier and 506,000 tons for the whole of 1950. The bulk of 1951 imports of chemical pulp came, as before, from Sweden and Finland. While in 1950 arrivals from Sweden were considerably higher than those from Finland, last year the position was reversed. Imports from Canada rose from about 72,000 tons for 11 months of 1950 to roughly 125,000 tons for 1951; only minor quantities of chemical pulp came from the United States.

Norway again was the biggest single supplier of mechanical pulp to the United Kingdom but the quantity of wet groundwood imported in January-November 1951, almost 165,000 tons, was somewhat smaller than imports from that source a year earlier. Imports from both Sweden and Finland increased, and arrivals of wet mechanical pulp from Canada, although of minor importance in terms of absolute volume, were, with about 35,000 tons, more than four times larger than in 1950.

Italy. There was a marked decrease in imports of both chemical and mechanical pulp in 1951. During the first half of the year imports of chemical pulp were about 74,000 tons, less than a quarter of those a year before, and imports of mechanical pulp and dropped from about 25,000 tons to 9,000 tons. During the first three-quarters of the year imports of mechanical pulp were 58 percent of the 1950 level, although receipts of paper pulp were very close to the previous year's figure and imports of rayon pulp were increasing. Preliminary estimates for January-October 1951 showed a 15 percent decrease in imports of all paper pulp, both mechanical and chemical, and a 43 percent increase in receipts of textile pulps.

France. Imports of chemical and mechanical pulps increased considerably during the first half of 1951. As a contrast, pulp imports into Germany decreased slightly. They increased later in the year, and imports of paper cellulose during the first ten months, 167,000 tons, were already close to total imports of the same grades during the whole of the year 1950.

Prices

During the early part of 1951 the rising trend in pulp prices continued; and extremely high prices for "spot lots" of Scandinavian pulp could be obtained on certain markets. Since the second quarter of the year, however, a certain stabilization was noticeable with no more opportunities to quote at fancy heights. This level which was maintained on export markets for Swedish pulp (except the United States) throughout the last two quarters of 1951, was about 2½ to 3 times higher than at the beginning of the Korean war.

According to official Swedish figures, average export prices for all Swedish pulps have shown the following trend (index 1949=100):

1950	1st quarter	100
	2nd quarter	109
	3rd quarter	121
	4th quarter	159
1951	1st quarter	198
	2nd quarter	303
	July	329
	August	329

It is of interest to compare these figures with the unit value indexes for exported Finnish mechanical pulp and dry cellulose (index 1935=100), as published by the Bank of Finland.

	Mechanical Pulp	Dry Cellulose
Whole year 1949	1 249	1 144
Whole year 1950	1 386	1 355
1950: January-October	1 324	1 282
1951: January-May	2 618	2 794
January-July	2 837	3 034
January-October	3 124	3 593

By December 1951, the average export price index for Finnish chemical pulp had climbed to 4,869 (1935=100). At the same time, the corresponding index for plywood was only 1,947, that for sawnwood 2,947, and the export price indexes for paper and unsawn timber 3,261 and 4,102 respectively.

Under such circumstances the returns from pulp export sales were clearly of great importance to the economy of the three northern countries, and special export charges have been introduced in Finland, Sweden and Norway. The nature and amount of the charges vary widely in each country, but as a rule there is a sliding scale according to price. In Norway, for instance, the charge on the September 1951 export prices was almost 25 percent for mechanical pulp, 33½ percent for bleached sulphite and 30½ percent for

rayon pulp. The export charges in Sweden and Finland are less severe.

In the importing countries the trend in prices for pulps of foreign origin was influenced almost solely by the developments in Scandinavia, as relatively small quantities of pulp were coming from non-European sources. In France, for instance, the average price for all imported unbleached sulphite was, in August 1951, about 229 percent higher than a year earlier and 84 percent higher than in January 1951. The price for all imported unbleached kraft pulp had, by the same date, increased by almost 265 percent during the preceding twelve month period and by 103 percent from the beginning of the year. In the prices for imported bleached chemical pulps the comparative rises were around 170 and 87 percent respectively.

There were wide differences in pulp prices paid during the latter part of the year. Quotations for Scandinavian pulp on the European markets were from at least 25 to 35 percent higher than the ceiling prices for European pulp fixed in the United States. On the other hand, the ceiling import prices in the United States were still 50 to 60 percent above the maximum prices for domestic pulp.

A considerable divergence existed in Europe between prices for imported Scandinavian pulps and those originating in the United States and Canada.

In all of the major exporting countries in Europe prices of pulpwood showed very substantial increases during the last months of 1951. As demand for pulp remained strong toward the turn of the year, no immediate decrease in pulp prices was in sight. There were some price fixings at slightly increased prices, but on the whole Swedish and Norwegian prices for exports to the United Kingdom were the same in the first quarter of 1952. It was, however, reported that Finnish exporters decreased, by the beginning of February, the price for unbleached mechanical pulp to be sold to the United Kingdom, so that the earlier difference between Finnish and Swedish prices for this particular product on that market disappeared.

Outlook in Europe

Pulping capacity is likely to increase from 1952 onwards in Europe. In France, for example the theoretical capacity of the pulp industry will be by the end of 1952 about 790,000 tons, as compared to 619,000 tons in 1951. Of the aggregate increase, straw pulp manufacture will account for about 51,000 tons, and the pulping of broad-leaved species for 79,000 tons.

In Finland, a new mill is planned to produce 30,000 tons of mechanical pulp annually, and in Sweden expansion will provide for an extra 40,000 tons of sulphate pulp annually, but these plants are not expected to come into operation before 1953. In Western Germany a new plant with an annual capacity of 48,000 tons of sulphate and 12,000 tons of semi-chemical pulp is projected. It will be the first sulphate mill in the country and is expected to meet about 40 percent of the need for this grade of pulp. It is believed that one-third of the wood requirements of the new factory can be covered by domestic pulpwood and the rest by waste.

In Portugal, a sulphate mill with a yearly capacity of 20,000 tons is reported to be under construction. This production would meet the country's own requirements and leave some 5,000 tons annually for export.

As yet it is difficult to see to what extent the European pulpwood supply situation in 1952 will differ from that in 1951. Trade figures relating to the first six months of 1951 show that Yugoslavia was able to increase its exports of pulpwood to Germany and Austria considerably. Yugoslavia, which is the greatest single supplier of pulpwood to Italy, has extended its trade agreement with the latter country until August 1952. Poland also was more active in its pulpwood sales than a year earlier. Polish exports of pulpwood may be affected when the big pulp and paper mill starts operating which is now under construction at Kostezyn, and which is reported to have a higher capacity than the total prewar pulp industry of Poland.

Finnish roundwood exports have been under a system of licensing since January 1952, which means that the distribution of exportable quantities of pulpwood will not be determined by price but by consideration of currency and other factors within the framework of the official trade policy. A first consequence of this new arrangement has been an agreement with Switzerland providing for purchases of pulpwood (350,000 steres), covering practically the total Swiss import requirements for 1952.

One of the major factors influencing the pulpwood supply situation in 1952 will still be the intensity of the competition for small-sized roundwood by various interests. According to the Timber Committee of the Economic Commission for Europe, towards the end of 1951 there was an easing on the European pulpwood market, with a slight price decrease and consequently reduced competition between buyers of pulpwood and pitprops.

As to developments in pulp trade in 1952, the following are a few pointers. Pulp imports into the United Kingdom came under a system of licensing as of November 1951. According to unconfirmed reports, imports in the first six months of 1952 would be kept within a value quota allowing a total import quantity about 7 percent lower than in the first half of 1951, estimated quantitative reduction being 5 percent for mechanical pulp and 16 percent for chemical pulp. Paper mills in the United Kingdom will also need special licences to use pulp, and the allotments will vary for different paper qualities. Additional reduction of pulp allotments are expected from the beginning of March. These new regulations will naturally affect imports from the northern countries.

The "austerity program" proclaimed by the French Government at the beginning of February 1952 includes severe cuts in imports. While it is reported that pulp imports are to be put under a system of licensing, it is not yet clear to what extent the new policy will affect total pulp imports.

The competition of North American pulp on European markets has so far been of secondary importance, due to the relatively small quantities available or allotted for export and the dollar shortage in Europe. Even if, as is believed, the United States should be able in 1952 to release export pulp in a quantity considerably in excess of the amounts exported last year, it is not certain whether the dollar shortage will allow this cheaper-priced pulp to be taken up in competition with

Scandinavian produce by the importing countries of Europe. On the other hand, increased exports of North American pulp to Latin America and some other non-European markets may have an affect on exports from Northern Europe.

At the beginning of 1952 there were signs of growing reluctance to accept Scandinavian export prices, which had increased because of export charges. The United Kingdom and France reduced by 20 percent the ceiling prices for imported wood pulp from all countries other than the United States and Canada; in the United Kingdom the new prices were effective for contracts concluded after 11 February, and in France from 1 April. After that date quantitative restrictions on imports were abolished in France, so that the import of wood pulp is practically free.

These measures taken by the governments of France and the United Kingdom may be followed by action by other importing countries. They have created a confusing situation on the European market.

Aerial View of FAO Headquarters, Rome

Arbor Days and the World Festival of the Trees

During the Sixth Session of the FAO Conference in November 1951, as part of a tree festival celebrated throughout the country, the Prime Minister of Italy, Mr. De Gasperi, joined with representatives of nearly all the member nations of FAO in clothing a deforested slope outside

the ancient city with new trees. Later the FAO Conference, on the initiative of the representative of India, adopted a resolution calling on each member country of the Organization to arrange that each year, on dates suited to local conditions, a World Festival of the Trees should be celebrated to help arouse mass consciousness of the aesthetic, physical and economic value of trees — in that order. Many countries of the world already have their arbor days and tree festivals, and trees are often linked to religious festivals.

The aim now may well be to associate in people's minds the care needed to nurture trees with the devotion needed to bring tranquillity and plenty to the world.

The Italian ceremony of 1951 resumed the country's celebration of Arbor Day, which started as early as 1899 and was suspended during the war.

Wide publicity was given to the event, which has as its purpose to make the general public forest-conscious and to inspire a proper understanding of the importance of trees to the national economy. The campaign was carried on by radio and press; posters and special numbers of technical journals were issued; prizes were given for the best articles; medals were awarded to individuals and institutions who had made outstanding contributions to the cause of forestry; and the Postal Department marked the occasion by issuing the two special stamps reproduced here.

In Rome, where Arbor Day was celebrated on 21 November, the Prime Minister of Italy, Sig. de Gasperi, and each national delegation to the FAO Conference planted a commemorative tree as a token of the universal significance of the occasion.

Sixth Session of the FAO Conference

On the opening day of the Sixth Session of the FAO Conference at Rome, 19 November 1951, the Prime Minister of Italy, Sig. de Gasperi, formally handed over to the Organization its new headquarters building. This building now represents the concrete (and marble) fulfillment of that narrow decision of the last regular session of the Conference to transfer the FAO headquarters' activities from Washington to Rome.

The mere physical task of moving across the Atlantic ocean a large international secretariat with its civilian personnel and records confronted the Director-General with no small problem. Storms at sea and the disabling of one of the ships transporting FAO staff and goods were only part of the hazards encountered. Inevitably the move caused serious dislocations in the work of the secretariat and unforeseen delays were experienced in recruiting new staff, adjusting to a strange environment, and in getting work running smoothly again. By the time the FAO Conference assembled the worst of the disturbances were over, and the delegates could concentrate in spacious surroundings on the policy issues confronting them.

During the course of its three week session, the Conference admitted four countries to FAO membership: Argentina, Japan, Nepal and Laos. This brings the active membership to 66 nations, China and all the eastern European countries having now withdrawn from the Organization. One of the melancholy tasks of the Conference was to bid goodbye to Lord Bruce of Melbourne, independent chairman of the FAO Council. His untiring interest and inspiring leadership have been deeply appreciated by the small as well as the large countries that are members of FAO and the Conference expressed its profound gratitude for the benefits FAO had derived from his long and distinguished career of public service. As new chairman of the Council, the Conference elected Mr. Josué de Castro (Brazil), and it renewed the appointment of Norris E. Dodd as Director-General until the end of the next regular session of the Conference in 1953.

Policy Issues

The general tenor of the Conference deliberations was that FAO, using the title as expressing the combined efforts of all the Member Governments, should now begin to show more positive results. Member countries as a whole had only to a small degree fulfilled the obligations they accepted in signing the FAO Constitution, and with exceptions they had not put into operation, on the scale necessary, the recommendations they themselves had repeatedly made. No great purpose could be served merely by a confession of shortcomings. "This is an occasion," the Director-General said, "for a change of heart." What governments had to undertake was no small thing, "but can there be the slightest doubt that action along the lines proposed would be to their great and early benefit?"

Some forceful speeches were made by Ministers and other delegates, and the Conference went on record as calling on all member countries to prepare and carry out development plans, suited to their own circumstances and conditions and covering the next five years, designed to improve conditions for increasing food, agricultural and forest production. There were many important elements in any such program, such as the development of water resources, the provision of requisites, research and education, making the technical knowledge of the more advanced countries available for application in the rest of the world, and the avoidance of preventable waste in production, use and distribution. The Conference considered that few if any elements were of greater importance than extension, education and demonstration work, and these spheres of activity must receive greater attention both by Governments and the Organization. There were various associate problems to which FAO must also give emphasis - reform of agrarian structures (land reform) in the broadest sense, capital investment for development, and migration. A certain amount of work on these problems as they affect forestry has already been done by FAO, and ways in which they may be tackled more coherently are now being examined.

Forestry Panel

These were the broad policy decisions of the Conference. Detailed matters of policy were discussed by

technical subjects and, to consider forestry, there were present many senior foresters and heads of services. With other delegates briefed to watch forestry interests there was an average attendance of about 40 members at the meetings of the Forestry Panel, a committee of the Conference which, whilst having no official status, prepares proposals and policy decisions for eventual Conference consideration. One of the actions of the Conference was to abolish the Standing Advisory Committees that had been formed in the early days of the Organization to help the Director-General formulate a balanced program for the work of FAO. Their place, in this sphere, is now largely taken by the technical panels - for forestry by the Forestry Panel.

Delegates elected Mr. Lyle Watts, Chief of the United States Forest Service as chairman of the Panel, and Mr. M. D. Chaturvedi, Inspector-General of Forests, India, was appointed rapporteur. For the special item *Principles of Forest Policy*, which is printed in full on pages 2-3, Mr. O. J. Sangar, Director of Forestry, England, was selected as rapporteur. The Forestry Panel broadly reviewed the work of FAO in the field of forestry over the past year and approved in principle the Director-General's proposals with regard to the long-term program. It expressed confidence in the way the separately financed Expanded Technical Assistance Program in forestry was being organized, and felt that support must be given to Mr. Leloup, Director of FAO's Forestry Division, in attempts to eliminate projects of less immediate urgency from the activities which came under FAO's normal budget, even though they had been recommended by various meetings and were especially dear to some interests.

Conference Recommendations

The Conference, in endorsing the conclusions of the Panel, agreed that a Fourth World Forestry Congress should be held in 1954, at a place and date to be decided by the FAO Council after consultation with interested governments. It thought that the proposed Tropical Forestry Congress, which had been asked for by the Third World Forestry Congress, should rather be incorporated into the fourth world meeting where full opportunity should be allowed for the technical discussion of particular problems that concerned tropical countries.

The secretariat was empowered to collect and publish available information on the forest resources of all countries of the world at five-yearly intervals. The results of a first enquiry of this sort had been published in 1948, so that the next could properly be undertaken in 1953. The Conference also authorized the Director-General to constitute, as a temporary measure, an International Chestnut Commission (see *Unasylva Vol. V, No 4*), and asked all Member Governments to organize annually in their countries a "Festival of the Trees" as a means of developing appreciation in the masses of forest values. Standard certificates of quality and origin of seeds of forest tree species were approved for use in establishing authenticity of material, and standard consignment forms were recommended to governments as a means of expediting the international exchange of seeds and plants for scientific purposes. An International Plant Protection Convention designed to prevent the spread and facilitate the control of plant diseases and pests was signed by representatives of a number of governments.

A considerable amount of discussion took place on the kind of action which FAO could best take in regard to land and water utilization and conservation, and how the question of shifting cultivation should be studied by both forestry and agricultural interests. The Director-General's proposals for work in these fields were approved, and also the program relating to range-management and conservation of "wildlands," which will involve the creation of a new section within the Forestry Division to work in close liaison with the Agriculture Division.

Increased Pulp Production

Finally, the Conference considered a request addressed to FAO by the Economic and Social Council of the United Nations to lend assistance in long-term efforts to overcome the world shortage of printing paper and newsprint. The Director-General of UNESCO, Mr. Torres Bodet, had emphasized the seriousness of the present situation and stated that the position had markedly deteriorated since FAO organized a conference on world pulp problems at Montreal, Canada, in 1949. The Conference recognized that FAO bore a major responsibility for efforts directed towards a solution of the existing situation. The Organization was already working in some degree to this end but should intensify its efforts. Accordingly, the Conference made three recommendations:

(1) that FAO, in consultation with the International Materials Conference (Washington) and other interested intergovernmental agencies, survey the possibilities for increasing the production and transportation facilities for pulpwood;

(2) that Member Governments
   (*a*) take action aimed at increasing pulpwood supplies, including adjustments in forest policy such as planting quick-growing pulpable species, and developing and using suitable supplementary or substitute raw materials;
   (*b*) consider the advisability of establishing or encouraging new pulp and paper manufacturing plants in areas where permanent supplies of raw materials (including processing materials) in adequate quantities are assured;

(3) that Member Governments avail themselves of facilities provided under the Expanded Technical Assistance Program by addressing formal requests to FAO for (*a*) exploratory missions to assist in selecting possible sites for new pulp and paper mills taking into account local technical and economic conditions; (*b*) advisory missions to help in drawing up detailed plans for such mills, with due consideration to the conservation of forest resources and the establishment of the necessary transport facilities.

The Director-General will report periodically to the Economic and Social Council (ECOSOC) on the progress achieved in these directions.

Terms of Reference for Forestry Division

The terms of reference of FAO's Forestry Division were set out in one of the Conference documents as follows.

The Forestry Division acts as technical adviser to the Director-General in all matters concerning forestry, forest products and forest lands and assists him in carrying out relevant recommendations of the Conference and the Council in regard to the conservation and development of forest resources, the improvement of the production, utilization and distribution of forest products, and the raising of living standards through the optimum use of the forest and its produce.

The Division's field of responsibility includes:

A. *Forest Policy and Conservation*

(1) The formulation of sound conservation policies governing the development and wise use of lands [1] for the production of wood and other forest produce; formulation of policies for the development of forest industries in keeping with sustain-

[1] The lands which are the special responsibility of the Forestry Division in performing its functions comprise all forest land as defined by sound national forest policies, including grazing, recreation and watershed protection lands within forest boundaries and forming integral parts of forested areas. Outside the boundaries of the forests so defined, are large areas of land at present of low economic value but suitable for development as forest or agricultural land. These are the joint responsibility of the Forestry Division and the Agriculture Division. The former Division is concerned with any misuse of such lands endangering forest lands, soil and water conservation over large areas, and also with the possible future use of such lands for forests. The latter Division is responsible for the conservation of such lands, their use for grazing, and their development for agricultural purposes. Co-operation between the two Divisions is maintained for the implementation of these respective responsibilities.

The new FAO Conference Building, the outside of which is seen on page 29, contains three fine halls, of which the main one, with its decorated ceiling, seen above, was used for the plenary sessions of the Sixth Session of the Conference. Largely the work of the designer Mirko, it is a notable example of the modern Italian style and is panelled in wood throughout. Fine wood panelling is also used in other parts of this beautiful new building.

ed maintenance of the forest resource; the development of a suitable body of forest law; the planning and organization of efficient administrative services; the co-ordination of national forest policies on the international level; and the formulation of international accords on basic principles of forest policy and on measures requiring action by governments;

(2) formulation of policies designed to regulate waterflow and soil conservation on forest lands (as defined in footnote 1), the use of forest for protection of rivers and reservoirs against silting, and for the protection of communities against disastrous floods; the wise use of such forest lands for such purposes as grazing, ([2]) recreation and protection of wild life;

(3) joint responsibility with the Agriculture Division in land mapping and classification, land utilization and conservation policies, and the problems of shifting cultivation (in regard to forest land as defined in footnote 1);

(4) promoting knowledge by the public of the importance of forests and forestry in national economies; scientific, technical, and propaganda films; education and training of professional foresters and tecnicians, subordinate forest staffs, forest and industrial workers; extension services for private forest owners; improvement of living conditions of forest workers and of communities living in or from the forest.

B. *Research and Technology*

Improvement of forest yields and improved utilization, with special attention to:

(1) silviculture; promotion of forest research; application of appropriate silvicultural methods to all forests' productive, protective, or other important functions; increased yields from managed forest; rational development of forests not in use; improved productivity of degraded forests; appropriate management, in accordance with forestry principles, extended to all forests;

(2) afforestation and reforestation: the creation or restoration of forests by artificial seeding or planting, with the object of restraining soil erosion, improving waterflow, restoring soil fertility, providing amenities, or producing increased supplies of forest products;

(3) forest protection; technical and administrative methods of combatting fire, insects, and diseases; improvement of forest protection practices; international reporting of outbreaks of pests and diseases;

(4) forestry equipment, collecting documentation and data and

([2]) With technical advice from the Agriculture Division on grazing problems.

issuing catalogues; advice and assistance in the use of the most suitable equipment and machinery for forestry operations, nursery and planting work, logging, transportation, and conversion;

(5) modernization and integration of forest industries; introduction of modern methods and equipment in existing industries; improved productivity and reduction of costs; integration of industries with the forest and forest management; investigation of yields and capital needs;

(6) promoting wood chemistry research; improvement in the chemical utilization of forest crops; new techniques and products; high-yield pulping methods, and use of new raw materials such as tropical timbers, hardwoods, bamboos;

(7) mechanical utilization of wood; rational methods of using timbers based on a thorough knowledge of mechanical and physical properties; standardization of sizes and grades of commercial forest products; standardization of terminology and nomenclature, testing methods; terms and procedures.

C. *Forest Economics*

Stimulation of wood production and consumption with special attention to:

(1) inventories of forest resources; securing increased accuracy and comparability in their results; improved methods and techniques in carrying out inventories; collecting statistics to enable regional and world appraisals of forest resources to be prepared and published

(2) appraisal of social and economic aspects of forest management and of industrial development; estimation of capital value of forest and of utilities derived from forests; taxes, insurance, credits and co-operatives; land tenure; colonization and immigration. Advice and assistance to governments on measures to promote economic management of forests, both public and private;

(3) analysis of national forest development programs; review of production and distribution policies; action on the international plane to avoid short-term unbalance between supplies and demand, promote production, and remove obstacles to trade; collection and publication of market information, forest products statistics, commodity reports; improvement of national and international statistical procedures;

(4) national and international action to bring about levels of consumption of forest products representing adequate housing and general living standards; investigating consumer habits, demand for forest products, consumption requirements for housing, paper, rayon, transportation, mining, etc.; assessing long-term requirements against available supplies; measures and policies to secure the gradual achievement of consumption goals.

Technical Assistance Notes

The completion of the first year of the Expanded Technical Assistance Program has been marked by steady, if unspectacular, progress in many countries. Many unforeseen difficulties have arisen, and by no means all have been overcome. On the other hand, the devoted work of the specialists sent out by FAO to so many parts of the world is fully proving the worth of the whole program.

In so far as forestry is concerned, 16 specialists have now finished their assignments, another 33 are still in the field, while requests for co-operation have been received from various governments which may involve the recruitment by FAO of a further 60 forestry experts.

Meanwhile, 18 fellowships have been awarded under which foresters from Burma, Ceylon, India, Indonesia, Iran, Syria and Thailand are studying in India, Cyprus, various countries of Europe, and in the U.S.A.

Missions Completed

The past few months have seen the completion of several forestry missions which were among the early projects initiated. J. Messines (France) has presented his report on fixation of sand dunes in *Libya*. In *Pakistan* the missions of A. Rule (U.K.) on logging, F. Cermak (France) on sawmilling, and of G. M. Hocking (U.S.A.) on medicinal plants have been completed and final reports submitted to FAO Headquarters. The final report by J. A. von Monroy (Austria), who spent several months in *Burma*, has been transmitted to the government; it contains recommendations for the initiation of three integrated manufacturing units and has been used to prepare a working program for the next four years. C. E. Simmons (U. K.) has completed a one-year mission in *Honduras* and A. C. Décamps (France) a similar tour in *Ceylon*. M. von Bottenburg, forestry adviser in *Colombia*, G. Becker (Germany) entomologist and M. Rocher (France), conservation expert in *Guatemala* and P. Allouard (France) industries expert in *Mexico*, have completed their assignments. A. N. Barker (U.K.) and C. Letourneux (France) have returned from a year's tour of duty in *Thailand*. F. F. Kollman (Germany) has completed his mission in *India*. The International Bank has published the reports of missions for Bolivia, Uruguay, and Surinam, in which FAO forestry technicians participated.

New Agreements

Mission or individual advisers are now working in the following countries: Austria, Brazil, Burma, Ceylon, Chile, Ethiopia, Guatemala, Haiti, India, Iran, Mexico, Pakistan, Paraguay, Thailand, and Yugoslavia.

Since the latest Technical Assistance notes appeared in *Unasylva*, a team of specialists has been assigned to Yugoslavia: C. W. Scott (U. K.) to advise on the organization and equipment of the Timber Institute at Zagreb; C. Syrach Larsen (Denmark) to make recommendations on the work of the Seed and Genetics Division of the Forest Research Institute at Belgrade; H. Leibundgut (Switzerland) for forest management; A. Dugelay (France) for soil conservation and rehabilitation of denuded areas; J. Pourtet (France) to advise on selection of fast-growing species for reforestation programs; F. Bender (Canada) specializing on wood utilization and use of "waste"; and J. S. Bethel (U.S.A.) to advise on the modernization of the plywood industry.

FAO has sent two experts to Paraguay - E. Saari (Finland) to advise on forest policy, legislation, and the organization of forest resources, and J. J. French (U.S.A.) to survey the possibilities for the development of timber production.

Seminar on Statistical Techniques

In September last a statistical seminar was organized at Helsinki jointly by the Government of Finland, FAO, UN, the International Labour Office, and the Economic Commission for Europe. A series of

Technical Assistance to India includes several sawmilling projects, principally in the Andaman Islands, where this photograph was taken. Hardwood logs are here being taken on board an adapted military landing craft for transport to the mainland. When new sawmills are working this may no longer be necessary.

lectures on forestry statistics were given as follows:

- Forest and Felling Statistics - E. Saari.
- Forest Enterprise Statistics and their Relation to Agricultural Enterprise Statistics - N. A. Osara.
- Timber Utilization Statistics - V. Pöntynen.
- Timber Price Statistics - Paavo Harve.
- Forest Work Wage Statistics - L. Heikinheims.

Mediterranean Training Center

I. T. Haig (FAO) delivered two lectures on forest development and appraisal at a Mediterranean Training Center, organized by FAO and other UN agencies at Ankara, Turkey, in December 1951. He dealt with the systematic preparation of development projects, illustrating his thesis from his own experience with such a project in Chile.

Far East Training Center

The Government of the Philippines has agreed in principle to act as host country for a Far East Mechanical Logging Training Center; the details of the agreement are now under negotiation, and invitations to governments to participate are being issued.

H. G. Keith (Canada) who recently retired from the post of Conservator of Forests, North Borneo, will be co-director of the Training Center. After visiting firms in Canada that manufacture equipment, he moved later to Manila to begin active organization of the training course.

Brazil

R. Gachot (France) who with K. McGrath (Australia) has been making field trips in the Amazon region of Brazil, reports that sawmills are very numerous, but mostly receive their logs by water from the upper reaches of the Amazon. The mills have old equipment and lack skilled labor; they produce well below capacity and none saws more than 2,000 cubic meters of lumber per year. Meanwhile, lumber is needed for construction in the mountain valleys inland, but transportation costs to bring back supplies from the existing sawmills are excessive; new small sawmills are greatly needed here.

N. M. Gallant (U. K.) has recently joined this Technical Assistance team to investigate marketing problems.

Ethiopia

E. H. Swain (Australia), FAO officer in Ethiopia, writes: "The Minister for Agriculture and Forestry asked me to conduct His Imperial Majesty at the Grand Exhibition through the Forestry exhibit (a tree of plenty spilling on to surrounding shelves the produce of forests from charcoal to schnapps). I apologized for the imperfections of a Forestry Baby which had just been born to Ethiopia - H.I.M. neatly replied that he was sure that the baby would grow up to be perfect."

Haiti

"One experience is perhaps worth relating," reports V. L. Burns, the FAO forestry officer in Haiti. "A peasant was found cutting the forest on a steep ravine. The official with whom I was traveling stopped to tell him it was illegal to cut trees on such a steep slope and, moreover, that mahogany and pine were protected species and never to be cut without permission. The man pointed out that there were none of these species on his land. We looked and were satisfied. To clarify the position in my own mind, I began to talk

to the official about succession. In this area, mahogany was a climax species and what the peasant was cutting was really a seral stage. We spoke in Creole from habit and the peasant listened. This was August. In October I returned and stopped to talk to the peasant again. He proudly showed me young seedlings of mahogany and tavernau (*Lysiloma latisiliqua*) that he had planted in the area. "Why did you do this?", I asked. "Well", he replied, "I did not understand what you said, but it seemed important, so I put these trees back." I was struck by this so I induced him to start a small nursery and now he is a valuable convert to forestry."

Eucalyptus Study Tour

Many countries are showing an increasing interest in fast-growing species of tree, with a view to increasing supplies of both fuel and pulpwood. Species of eucalyptus already widely planted in many areas, offer good possibilities for economic development in these directions. The particular species used to date have generally been chosen on an empirical rather than a scientific basis. Higher yields can be obtained from species or strains better adapted to local soil and climatic conditions.

The Sixth Session of the FAO Conference, realising that great benefits would arise from an opportunity to study eucalyptus in its many varied environments in Australia, approved a study tour in that country to be conducted under the Expanded Technical Assistance Program. The Government of Australia has consented to act as host country for this study tour, to start at Sydney on approximately 1 September 1952. Interested countries are being invited to nominate either senior officers of their forest services or technicians of commercial enterprises responsible for reforestation or research programs. The main purpose of the Tour is to demonstrate the Australian species in their native habitats, and enable members to get first hand knowledge of their possibilities. The Tour will include studies, lectures and visits to research institutes and industrial plants, and should furnish an opportunity to become acquainted with the distribution of species, the ecological, climatic and soil factors involved, growth rates, natural and artificial regeneration, the silvicultural treatment of stands and current utilization practice, including sawing, seasoning and pulping methods.

Far Eastern Timber Grading Course

Development of the timber trade, both for domestic and export purposes, provides a favorable means of improving the economic prosperity of Far East countries. Lack of precise identification of woods and diversification of timber grading practices have proved obstacles in the past. The regional technical meeting on Standardization of Timber held at Dalat in 1950, and later the inaugural session of the FAO Asia-Pacific Forestry Commission, suggested the holding of a timber grading course as a useful beginning in the removal of these obstacles. As a result, the Federation of Malaya, with the approval of the United Kingdom, acted as host country to the FAO-sponsored Far Eastern Timber Grading Course which finished at Singapore on 23 February 1952. The school opened at the Forest Research Institute at Kuala Lumpur on 8 January and moved to Singapore on 16 February. Nineteen representatives from seven countries participated. Subjects covered included defects in timber and their terminology, theory and practice of grading of logs and timber, documentation of timber for export, and practical work in wood indentification and grading. Very great keenness was shown by participants, as was evidenced by the results of the examinations held at the close of the course. Advice received by the Forestry Division since the termination of the course indicated that some of the trainees are already applying their new knowledge to their regular work at home.

Training of Forest Workers

Logging Techniques and Training of Forest Workers

At its seventh session the Timber Committee of ECE recommended the study of various aspects of productivity of work in the forests, and the matter was referred to FAO's European Commission on Forestry and Forest Products. At the fourth session of this Commission held in Rome, October 1951, a pilot committee on Logging Techniques and Training of Forest Workers was set up.

This pilot committee held a first meeting at Geneva, 25-29 March, 1952. Representatives of Austria, Finland, France, Germany, Italy, Switzerland, Sweden and the United Kingdom took part. Observers were present from UN, ECE, ILO and the International Union of Forest Research Organizations (IUFRO).

The delegates heard a lecture on the Training of Forest Workers by Hans Winkelmann, Switzerland, and saw films and slides supplied by a number of countries dealing with the problems under discussion. Also, by invitation of the *Office Central Forestier* of Switzerland, the Committee visited a training camp for forest workers at Bulle in the canton of Fribourg.

Initial Program of Work

The pilot committee considered that its first task was to review past and current work and plans in member countries on the rationalization of forestry work. The initial program of work of the committee should be limited to:

1. *Working techniques and methods*

The committee agreed that, by international comparison of productivity of work in the forest, possible specific improvements in techniques might be brought to light, provided that a basis for international comparability could be established. In this connection, it was agreed that model logging sites should be chosen where investigations could be made, and certain conditions for these sites were laid down.

It was felt that an effort should also be made to measure the standard of efficiency of the forest worker and a small working party was set up to investigate this.

The committee considered that performance scales existing in some countries should be compared internationally, and the Secretariat was asked to make the necessary enquiries from Member Governments so that an analysis could be made.

2. *Mechanization of operations*

The committee decided that studies should be undertaken on the experience gained on machines for forestry operations, especially on the use of power saws and of mechanized equipment for loading. The delegate of Sweden offered, subject to the agreement of the authorities concerned, that the first study on the latter subject should be carried out by a Swedish institute; the study on the use of motors in loading is to be carried out by an institute in Finland.

The committee considered special forestry criteria and equipment for tractors and drew up a list which was to be sent to delegates for further amendments; a review of the 1951 Tractor Catalogue issued by FAO was deferred to the next meeting of the Committee, after these amendments were known.

Since it was of the greatest importance that a list of criteria for tests should be established, the committee instructed the secretariat to assemble information on the testing of forestry tractors and equipment.

3. *Training of forest workers*

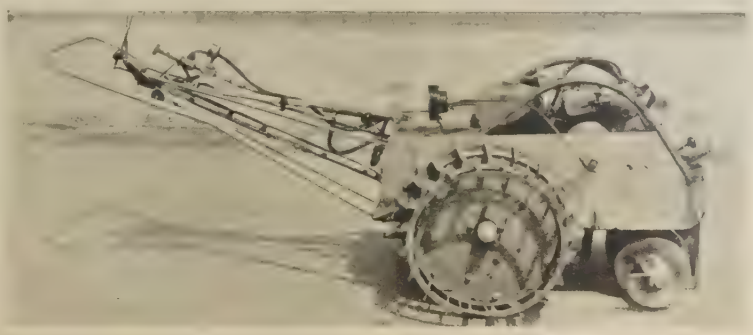
The Committee discussed and agreed in principle a draft plan submitted by the International Labour Office for a study on the training of forest workers, and requested the ILO to undertake the study.

Equipment News

The continual development of forest utilization and woodworking industries is reflected in the increasing demand for information on new equipment. FAO's Forestry Division, on the recommendation of the FAO Conference, collects such information and sends it on request to Member Governments. The Forestry Division would appreciate receiving data from manufacturers all over the world; specifications should be accompained by clear, sharp photographs (glossy prints). FAO, however, can accept no obligation to publish all such informatoin received.

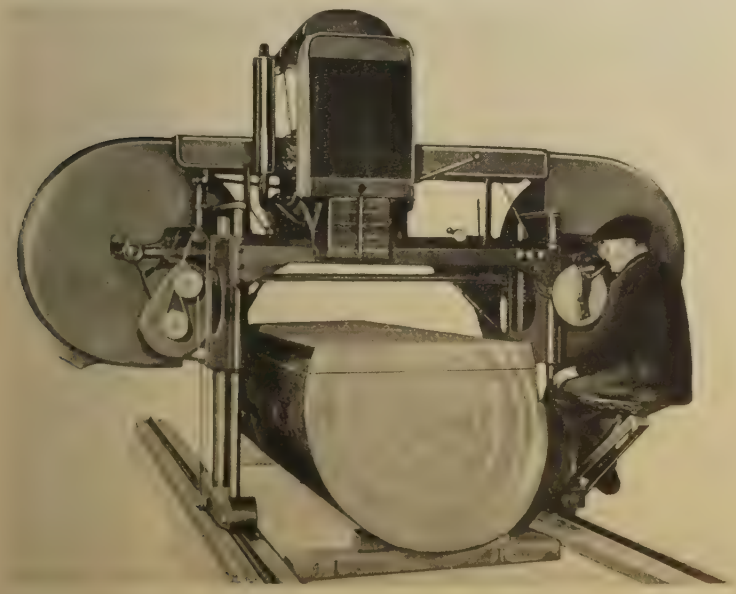
SPIRAL ROTOR TRENCHER. — This trencher, powered by a 6 h.p. gasoline engine, is designed to construct a fire line 18 to 24 in. in width. In operation, the spiral digs down to mineral soil and pushes the ground cover to either side. It is designed for working in deep soft soils, thickly matted grasses and medium brush types.

This is a pilot model weighing 550 lb. and under test conditions has been operated on slopes of 55%, and on side slopes of 30%. Normal working limits up and down slopes are expected to be 40%. Forward speeds - 3/4 m.p.h., 1 1/4 m.p.h. and 2 1/2 m.p.h.; reverse speed - 1/2 m.p.h.



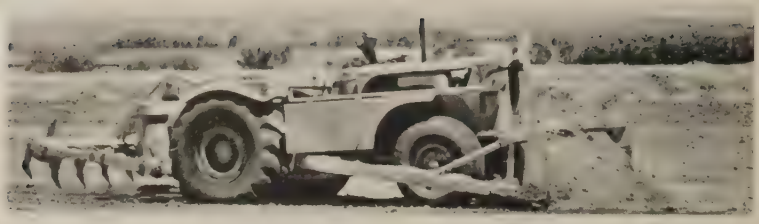
U. S. Forest Service, Equipment Development Center, Arcadia, California, U.S.A.

FORESTIERE C. D. 4. — This saw is easily transported, can be used anywhere and is simple in operation even for unskilled labor. It can be set up anywhere, requires about two hours to install and does not need any foundation or concrete work; it is simply placed on its rail track which has been carefully aligned and levelled. Since the machine is carried on guide rollers fitted with needle bearings the feed is flexible. The operator varies his feed speed according to the hardness of the wood, and, if he feels the slightest resistance, slows down; adjustment of the thickness of timber cut is obtained by means of a small graduated wheel.



Etablissements C. D., M. P. Lanson, 37 rue de Lille, Paris 7e, France.

Specifications: Petrol, electric, or diesel motor as required. The petrol motor is of 20-25 h.p., 4 cylinders; the electric motor averages 15-20 h.p. The saw pulleys are 1 m. in diameter, 90 mm. in width. The saw tension is obtained by means of a hydraulic appliance, the pressure being controlled with aid of a gauge; there is also a compensating spring. The Forestière C. D. 4 can use band saws up to 4 m. in width and can be used to cut logs up to 1.4 m. in diameter. The gauge between the rails is 1.50 m. and it is supplied with a track 6 m. long, which can, however, be lengthened indefinitely so that several logs can be sawn one after another without stopping the machine. Average production is 1 to 2 cu. m. per hour for colonial timber; lineal speed of saw 22 m./sec. for hardwoods with a swaged tooth of 35 mm. pitch; 45 m./sec. for softwoods with a tooth spacing of 50 or 60 mm. The saw is fitted with a set of pulleys whereby the speed of the band saw wheels can be adjusted according to the species sawn.



Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR DW WITH CATERPILLAR STRAIGHT BULLDOZER. — *Specifications*: Overall dimensions - length 20 ft. 10 in., width 10 ft. 2 5/8 in., height 6 ft. 4 in. Blade - cutting width 10 ft. 2 5/8 in., height 38 in., maximum lift above ground 44 in. Weight distribution of complete unit - DW 10 Tractor 15,140 lb., No. 21 cable control 1,520 lb., No. 105 Bulldozer 9,100 lb.; counterweights 7,000 lb.; total weight 32,760 lb.

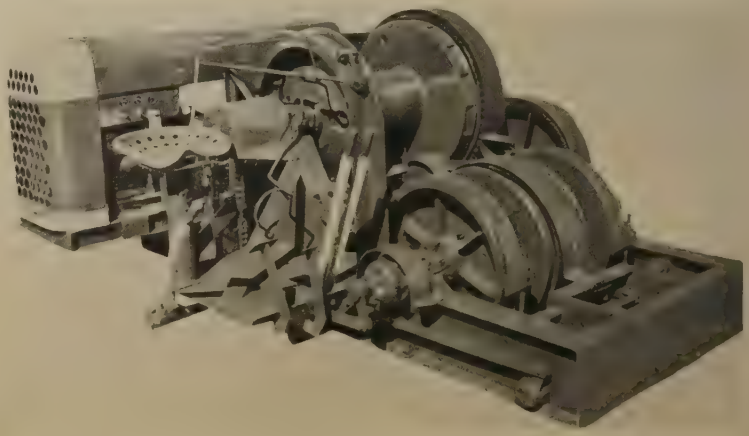
LOGGING ARCH. — This logging arch is suitable for use with small crawler tractors or a caterpillar track-laying vehicle equipped with a winch, and bears timber loads of from 4 to 6 tons. The frame consists of three sections secured by lock pins and is easily and quickly assembled and dismantled. The arch is formed of a heavy section steel tube in "A" form with stub axles at the lower legs and roller-gear at the top; attached to this is the pole member which is composed of a steel channel. The other end of the pole is swept down to suit the tractor drawbar and is equipped with a universal action two eye. The distance between the eye and wheels is 9 ft., the overall width 7 ft. 2 in. Stndard tire equipment is 11.00×20 mounted on pressed steel disc three-piece wheels.

A "yoke" at the top of the pole reinforces the pull from axle to drawbar; the roller-gear is mounted with a substantial sheave for taking the tractor winch-rope and hauling logs upward under the "A" frame. Total weight of logging arch, including 11.00×20 wheel tires, is 15 cwt. 3 qtr.

Universal Power Drives Ltd., Aintree Road, Perivale, Middlesex, England.

HAYES SIMPLEX LOADER. — This machine is composed of one load line drum and two smaller drums for swinging boom under power-main line drum.

Specifications: capacity up to 1,000 ft. of 1 in. cable. Swing drum brakes are of band type 27×3 in. controlled by one foot pedal. Swing drum pull approximately 36,000 lb. at 79 ft./min. in low gear. Chrysler industrial model 251 F: 6-cylinder motor with fluid coupling and 4-speed transmission driving through double universal joints to ball-bearing power take-off. Other power units can be supplied.

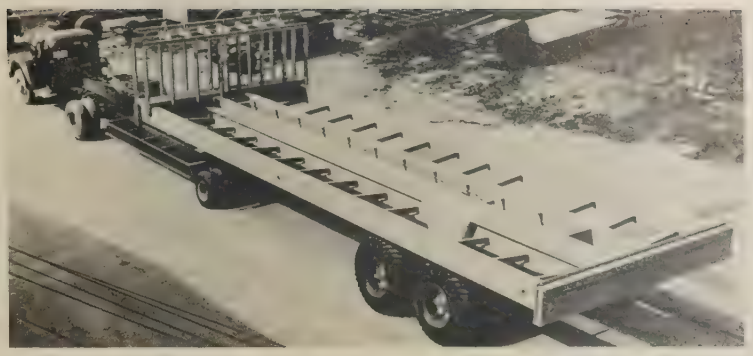


Hayes Manufacturing Co. Ltd., Vancouver 9, Canada.

PRECO BACK RIPPERS. — This fitting provides a new time-saving approach to earth moving for angling-blade bulldozers. Welded to the underside of the bulldozer frame, the rippers prepare the ground by ripping and scarifying when the bulldozer is backing up for the next forward blading operation; they float freely while blading is taking place. Teeth and shanks penetrate approximately 8 inches when back ripping and can be retracted for carrying, back trowelling or smoothing. Housings are installed on the back of bulldozer mouldboards. Shank size is 3×4×26 in. Photo shows model R. A. 8 back rip scarifier mounted on Caterpillar D. 8 in action.

Preco Inc., 6300 E. Slauson Ave., Los Angeles 22, California, U.S.A.

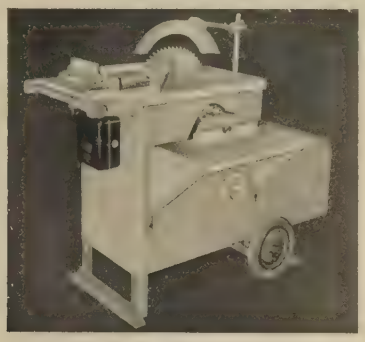
LARGE PULPWOOD TRAILER. — King model L82SW Tandem Axle Logging Semi-trailer for carrying 16 one-cord bundles of pulpwood. This trailer includes 14.00-24 20-ply tires, with hard rock lug type tread (8 only), wide base demountable type rims; 24 in. fabricated steel-spoke wheels; Timken tapered roller bearings; King 8 axles of 40,000 lb. capacity each; 17 1/4×5 1/2 in. mechanical brakes on all wheels actuated by 2-line air system (no cab controls or connecting hoses); 35-ton running gear incorporating leaf springs and rubber mounted at trunnions and axles; lubrication required at brake camshaft bearings and wheel bearings only; all-welded steel frame 41 ft. long; load carrying beams consist of four sets of boxed 15 in. alloy channels; main rails 14×10 in. wide, flange alloy steel beams, 3 1/2 in. diameter king pin to suit A.S.F. type fifth wheels removable for servicing; double spare tire carrier.



Truck Engineering Ltd., Woodstock, Ontario, Canada.

THE PTI DIAL SET GAUGE. — For accurate checking of the set of circular saw teeth, this new dial gauge enables instant checking within .001 in. (.0025 cm.) of the set of any type of saw blade — tooth-rip, cross, conventional or safety.

PTI, 401 Broadway, New York 13, N.Y., U.S.A. (Photo by courtesy of Paul Blacker)

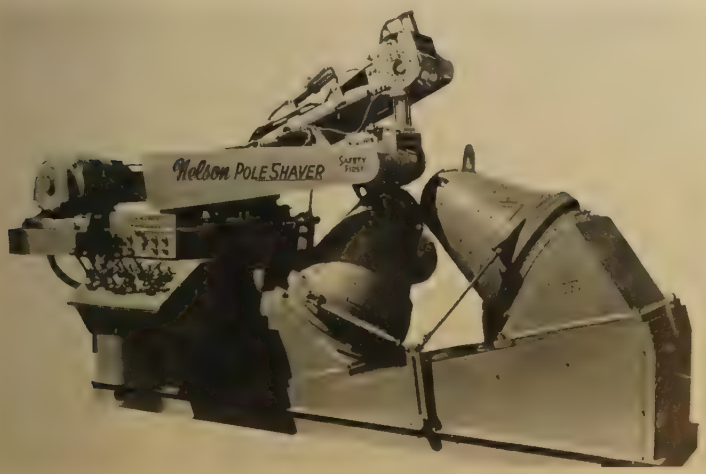


M AND P TRANSPORTABLE 18 IN. SAW BENCH. — *Specifications*: all steel frame, cast-iron table 35×19 in.; 3 h.p. electric motor, or 3 h.p. petrol engine; rise and fall rapidly adjustable giving 6 in. depth of cut; locking fence allows 7 in. width of cut and can be swung clear of table when cross cutting.

Moore and Partners Ltd., 89 Bartholomew Close, London E. C. 1. England.

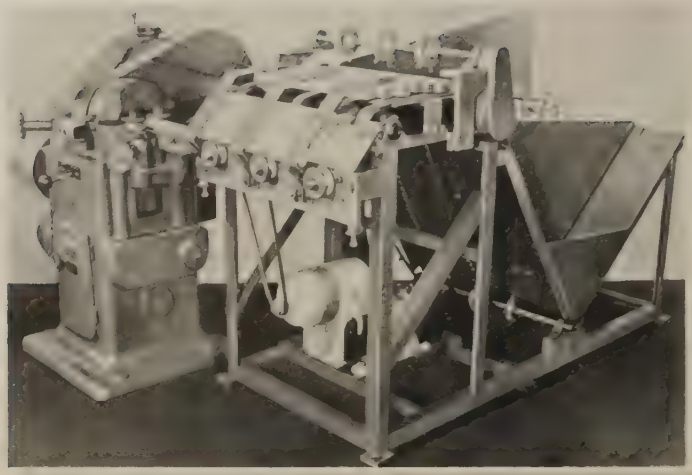
"EASY CUT" SAW. — Has new tooth design based on a different conception of wood sawing and offers certain advantages over conventional type saws. It has relatively few teeth and each tooth takes a limited "bite", thus minimizing kickback and grabbing action; requires less power and is quieter in operation. Best suited for ripping, it can also be used for rough cut off and combination work on either table type or radial arm machines. Size of saw ranges from 6 to 16 in. in diameter with 8 or 12 teeth to the saw, either solid tooth or carbide tipped.

Simonds Canada Saw Co., 595 St. Remi St., Montreal 30, Canada.



NELSON POLE SHAVING MACHINE. — The outstanding features of the machine are: the pole is completely peeled from end to end and the machine leaves no rings or feathers on the end of the pole; hydraulic controls; flexible depth of cut control; quick reversibility of driving mechanism. Cutter head revolves at 3,600 r.p.h. Shipping weight approximately 16,000 lb.

Nelson Electric Manufacturing Co., Tulsa, Oklahoma, U.S.A.



THE HAWKER MODEL 1951 ROD AND DOWEL MACHINE AND HAWKER AUTOMATIC FEED MACHINE. — The operator loads stock into the hopper, starts the machine and the hopper feed operation is fully automatic; manual loading of hopper can be quickly done from time to time as loads are complete.

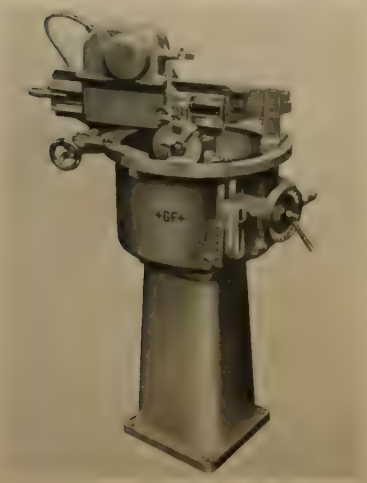
Specifications: Full productive capacity can be maintained continuously up to 200 lineal f.p.m.; adjustable speed of 5,000 to 7,500 r.p.m. with 4 cutter knife head, 3 interchangeable sizes of high-speed heads from 1/4 in. to 2 in. in diameter.

The Hawker Manufacturing Co., Dayton, Ohio, U.S.A.

RECORD SAND-PAPERING MACHINE WITH ZS-3M CYLINDERS. — This machine can be used for sand-papering hard and soft wood, curved, laminated, solid wood or wooden framework, synthetic materials and metals.

Specifications: Width of material that can be worked 4 ft. 3 in.; max. thickness of wood to be worked 4.7 in., min. thickness 0.08 in.; no. of polishing cylinders 3; diameter of polishing rollers 1 ft.; variable speed 13-33 f.p.m.; force required for rollers 3×10 h.p.; speed of cylinder draw 1,430 r.p.m.; net weight 9,482 lb.

Ulrich Steinemann S. A., St. Gall, Winkeln, Switzerland.



SHARPENING MACHINE FOR CUTTERS. — The sharpening machine is mounted on ball-bearings and moves in prismatic slots of hardened steel. The cutter which is fixed to the shaft remains blocked, while the grinding wheel is moved gently by hand along the cutting edge. Water cooling is carried out by pump; the grinding wheel is controlled by a 3-phase, belt-driven motor.

Specifications: Model JKO. 3: principal motor - 0.5 h.p. at 2,880 r.p.m.; motor for water pump - 0.1 h.p.; speed of grinding wheel shaft 4,350 r.p.m.; diameter of pulley of principal motor 2.6 in., diameter of pulley for grinding wheel shaft 1.7 in.; grinding wheel dimensions - diameter 5.9 in., thickness 0.6 in.; boring hole diameter 0.8 in.; lateral course of grinding wheel 6 ft. 6 in.; net weight approx. 551 lb.

Georges Fischer S. A., Schaffhouse, Switzerland.

PORTER CABLE GUILD SANDER MODEL 106. — Designed for cabinet makers, furniture manufacturers and millwork shops.

Specifications: The abrasive pad of the Sander model 106 revolves in a 1/4 in. diameter orbit at 4,000 r.p.m.; weight 6 lb.; length 9 1/2 in.; width 4 1/8 in.; height 6 1/2 in.

Porter Cable Machine Co., Dept. PR-1, Syracuse, New York, U.S.A.

News of the World

The items appearing here are condensed selections of news thought to be of interest to readers of UNASYLVA. *They are grouped alphabetically by countries under headings currently used by the Forestry Division for reference purposes. The Editor will be glad to receive direct from readers authenticated items of interest and of news value for this page of the review.*

General

UNITED STATES OF AMERICA

● Recently compiled specialized bibliographies available in the U. S. Department of Agriculture Library, Washington, D. C., include aerial photography and photogrammetry, 1942-1949; killing trees by poisoning; and shelterbelt planting, 1931-1951.

● The Forest and Range Experiment Stations operated by the U. S. Forest Service have developed a variety of methods and types of publication through which they enable customers and students to keep up to date on current work. Each station prepares an annual report in which summaries of results from the station's projects are given, classified according to the main divisions of work, such as forest management, protection, forest influences, range management, forest economics, flood control surveys, and wood utilization. These reports generally also summarize the plans for the ensuing year, arranged in approximately the same way as the current projects. The annual reports normally define clearly the main wildland and water problems of the region and relate the station's program to the problems, explaining, for example, why one station puts major emphasis on forest influences, another on range management, and still another on rehabilitation of deteriorated commercial forest lands. The administrative organization, a list of personnel and a list of experimental forests and working centers, together with projects conducted at each, are included in most annual reports. A list of papers prepared during the year by station personnel is also included.

These annual reports are invaluable to anyone who wishes to know the current and prospective program of each station, or the status of any particular project. The reports do not generally give background summaries of previous work in various fields or projects, but report principally on current findings. It is obvious that a collateral internal value of the reports is that research workers are compelled to keep reasonably up-to-date in analyses of their own work and thus avoid the pitfall of protracted delays while additional data are being accumulated. There is no completely standard form for these annual reports, and different stations adopt different plans in reporting in detail or in general terms on their work.

Another type of station report, in which the California Forest and Range Experiment Station is experimenting, is a short outline of the work, grouped by the major divisions, such as forest management, forest economics, etc., and giving under each a very brief summary of the major lines of work and the primary problem in land and water use towards which they are oriented. This treatment, together with the brief listing of experimental forests and work conducted at each, provides a useful type of summary to the student who merely requires a broad picture of station progress. Other stations in the system also bring out a similar type of general summary from time to time.

The director of each station endeavors to keep technical publication of results and plans reasonably up-to-date, as the long lists of titles published annually indicate. Technical publication is in a wide variety of forms; when major projects reach a definite stage, it is customary to report on them in the form of publications issued by the U. S. Department of Agriculture. Research workers are also encouraged to prepare articles for technical journals. In addition, each station has its own series of publications issued often in photostat or multilith form. In some cases these summarize very briefly the results and their application to specific projects; in others, they report on experimental techniques. At some stations, series reports on the results of the forest survey are prepared. These various series and forms of reports from individual stations are distributed, through the mailing lists which each station maintains, to technical libraries, forestry schools, etc., which regularly receive the publications from all stations. The advantage of such station publications is the usually up-to-date reporting on interesting or important new developments, of which the final report in more formal publication may not come for many years.

While station notes and reports are sent to interested applicants, it is often difficult to know what to ask for, and thus the recent introduction of a comprehensive bibliography of station publications is a useful innovation.

Emphasis has always been placed on annual progress conferences involving both station staffs and the administrative officers who deal with the practical management problems on the National Forests and on other forest lands as well. The purpose of these conferences is twofold: to subject station work to the practical viewpoints of administrative officers, and to keep them informed of research results which are, or should be, significant in forest administration. This type of conference and the mechanisms devised to maintain collaboration is evidence of the real intent to adapt research work to the current problems of land and water management and to make both research and administration parts of a single team — an objective far more important than that of permitting researchers to follow out personal hobbies to an undefined end.

UNION OF SOVIET SOCIALIST REPUBLICS

● Kirghiz Soviet Republic in the north-eastern corner of Central Asian Russia is a poorly timbered mountainous region. Its forest-covered area does not exceed 500,000 ha. (1,236,000 acres) of which junipers form 70 percent and Tien-Shan spruce 20 percent; from a timber standpoint it is of no importance. However, what makes the Kirghiz area of economic importance to the whole USSR is the unique concentration in southern Kirghiz of a large number of wild fruit and nut-bearing trees which include apples, pears, cherries, pistachio, and especially walnuts. From 50 to 75 percent of all the uncultivated fruits and nuts gathered in the USSR come from this area, which is particularly rich in walnuts. The walnuts obtained from southern Kirghiz are claimed to be of superior quality; in oil content (75 percent) and albumen they surpass not only French and Spanish walnuts, but also those growing in most of the other Central Asian Republics. Nowhere in the Soviet Union and probably in the entire world, are there such extensive pure walnut stands as on the slopes of the Fergana and Chatkal mountain ranges in this area. In Turkmenia there are reported to be only 25 ha. (62 acres) of pure walnut forests, in Uzbekstan - 150 ha. (370 acres); in Kazakstan - 600 ha. (1,480 acres); in Tadjikestan - 28,000 ha. (69,000 acres), but in southern Kirghiz continuous pure walnut forests occupy some 50,000 ha. (124,000 acres). The Government considers southern Kirghiz as the richest source from which to collect seed of wild fruit and nut trees for reforestation in other parts of the country.

Fundamental Science

New Zealand

• The great interest of the New Zealand Forest Service in *Pinus radiata*, the most widely used conifer in the country, is reflected in the fact that the first issue of "Forest Research Notes" recently started by the Forest Research Institute, is given over to a comprehensive bibliography of the species. The bibliography brings together all known references, arranged chronologically, and is divided into four sections. The first deals specifically with *P. radiata*, the second lists reference works in which descriptions of *P. radiata* appear, the third, publications dealing not specifically but largely with the species, and the fourth contains miscellaneous references in which the tree is mentioned. The first two sections are believed to be complete. Thus both practicing foresters and research workers will be able to find available material and to determine the still existing gaps in knowledge of the species.

United States of America

• Great interest has been aroused by the announcement of the discovery of a plastic substitute for humus, where the effect of the latter on soil structure is concerned. The new material, called Krilium, has been produced in small quantities in 1952. This substance may prove useful in stabilizing areas of exposed subsoils and in improving the structure of intensively used soils of high potential productivity. Although the cost may for the time being limit its wide employment, the material is of vital significance in illustrating the possibilities that do exist for the development of cheap, readily available materials which may ultimately be widely used to increase the resources of "problem" soils. In form, it is a fine white powder which can easily be worked into the soil. Its primary effect is to stabilize natural soil aggregates against the dispersing or slaking action of water. In poor soils, the aggregates (that is, the clusters of soil) may range from dust particles to large clods, but these aggregates have low stability to water. When the soil dries, it slakes down to a shiny, crusty surface and the soil shrinks and cracks. In such soil, seeds germinate slowly or may be destroyed as they attempt to push through the surface crust.

In well-conditioned soils, on the other hand, aggregates retain an optimum size ranging from that of a pinhead to that of a pea. There is no surface crust, roots can get the air and water they need, and the spongy soil lets water reach the roots and the subsoil instead of allowing it to be lost by run-off.

Silviculture

Canada

• The Ontario Department of Lands and Forests, through its Research Division, has devised a new seeding tool which is believed to be the most efficient yet available. It deposits one seed a time at a predetermined depth, the seed being coated so that small and irregular shaped seeds can be more readily handled. Experience to date indicates that one man can seed approximately 5 acres (2.02 ha.) per day at an average spacing of 6 feet (1.8 m.), and that the cost of pelleting and treatment is Can. $ 1.00 per pound of seed ($ 2.20 per kg.). The total cost per acre is around $ 1.50 ($ 3.70 per ha.), depending on species and productivity, as well as the wage rate of the workers. Advantages expected from the method are the ability to select the most favorable spots for the seed, and the reduced probability of their being destroyed by rodents.

• A recent experiment on the effect of slash burning on germination and primary survival of Lodgepole Pine (*Pinus contorta*) and Douglas Fir (*Pseudotsuga taxifolia*) in British Columbia, covered the following soils: 1) unburned with ash added; 2) unburned control; 3) burned, not leached; 4) moderate burn, leached; 5) extreme burn, leached; 6) burn after rain, leached; and 7) burned, humus added, leached.

The major conclusions were: 1) that there was no germination where ash was added to the unburned soil, due to the increased pH of the soil, the hardening of the ash layer and exclusion of oxygen and high concentration of the nutrient solution; 2) a higher percentage of organic material results in higher top/root ratio, and thus slash treatments which decrease organic material result in less vigorous seedlings; 3) soils that have not been leached after burning show a slow rate of germination due to high pH.

New Zealand

• In New Zealand it is recognized as highly important that the individual characters of parent trees of *Pinus radiata* selected for good form and growth should be perpetuated. Work has been under way for 17 years to study the feasibility of propagation by means of cuttings. Specific questions also included modifications of normal nursery methods for treatment of stock derived from cuttings, time for collecting cuttings, maximum age of parent tree from which cuttings can be successfully propagated, the type of branch and of cuttings giving best results, and the effect of root-stimulating hormones on cuttings. Cuttings were of the following types: (a) heeled and treated with Rootone; (b) heeled but not treated; (c) cut and treated with Rootone; and (d) cut but not treated.

Conclusions are as follows: (a) *P. radiata* cuttings of the types used in the experiments will strike successfully. The losses by failure are on the whole no greater than with seedling stock after lining out. (2) No special care was necessary in planting, the cuttings slipping easily into the hole made by the trowel. (3) Care had to be taken in cultivation between the lines, as each cutting formed an inverted pyramid in the soil. If this had been disturbed, direct contact with the soil at the base would have been disrupted and newly-formed roots broken off. (4) Wrenching as applied to seedling nursery stock to produce compact fibrous root systems caused difficulties, particularly with heeled cuttings, which were at various depths owing to their irregular lengths. It was found that cuttings needed to be buried at least half their length in the soil if they were to succeed and that rooting was at or near the bottom of each cutting. With the larger heeled cuttings, rooting was often as deep as 6 inches (15 cm.), and special care was necessary. The use of unheeled cuttings, of uniform lengths, greatly reduced difficulties in wrenching. (5) Lifting of cuttings for planting out was no more difficult than the lifting of lined-out seedlings. (6) The best time to collect cuttings from 5 to 7 year old trees is when the terminal over-wintering bud has formed, a stage usually reached in February. Cuttings from the side of the tree on which growth is vigorous are to be preferred. Those from marginal or open-grown trees with about 3/8 inch (0.95 cm.) diameter stock-wood and large buds are most resistant to drying-out before roots develop. From 2 to 4 year old trees, the best cuttings were provided by the first laterals to be formed in the spring; they are ready for collection from February onwards when they have developed a woody condition. Tops cut from one year seedlings in June almost all failed; those taken in August struck reasonably well. (7) The planting of the stock raised from the cuttings presented no particular problems, the hole made for seedling stock by current practice being large enough for roots to spread horizontally.

United States of America

• A recent number of "Tree Planter's Notes" issued by the Forest Service of the U. S. Department of Agriculture presents articles on tree seed, dealing especially with the effect of geographic origin on growth and yield of loblolly pine (*Pinus taeda*) and of nursery behavior of red pine (*Pinus resinosa*). It gives the seed laws of the States of Georgia and New York and the tree seed certification policy of the U. S. Department of Agriculture. The issue also mentions the availability of a publication "Storing Southern Pine Seed," Occasional Paper 123 of the Southern Forest Experiment Station. This publication states that the best

method yet developed is by dry, cold storage which involves refrigerating the seed promptly and continuously at a temperature not exceeding 41° F. and preferably between 32° and 5° F. Moisture content should be constant between 6 and 9 percent for longleaf pine (*Pinus palustris*) and between 9 and 12 percent for other southern pines. The main problems in storage are utilization of a dependable cold-storage locker or warehouse; avoiding injury to the seed during extraction; not letting seed lie too long before extraction, drying and storage; and drying the seed to the right moisture content in the earliest part of the storage period.

● A study of 159 plantations on abandoned fields and eroded lands in North Mississippi and West Tennessee has made possible a classification of planting sites and ability to forecast the probable success of plantations. The major influences governing survival and growth of plantations are soil depth, fertility of the surface soil layer, and soil moisture conditions. Thus the general scheme of site classification depends, first, on whether the soil is more or less than 24 inches (60 cm.) deep; second, on whether the surface 6 inches (15 cm.) of soil is mostly topsoil or subsoil; and, third, whether the site is moist, as on lower slopes and bottoms, or dry, as on ridges and upper slopes.

Except on the most favorable sites, results from planting hardwoods may be expected to be poor, and native pines, particularly loblolly pine (*Pinus taeda*) should be used. On good and medium sites as determined by the classification, plantations with 6 by 6 feet (1.8 m. × 1.8 m.) spacings are recommended, and there good survival and good yields of useable timber are to be expected. On the very badly deteriorated and naturally poor sites closer spacing, down to 3 by 3 feet (0.9 m. × 0.9 m.) is recommended, to allow for probable losses. Thus yields will be low and a primary value of plantations is to control erosion which pine plantations do successfully. The more severe the erosion of the site, the greater care is required in selecting the most favorable spots for individual trees and in setting them out correctly.

Union of Soviet Socialist Republics

● A method which has been long known and practised by gardeners and horticulturists is now finding a wider application in forest planting. The method consists of keeping the roots of seedlings submerged in water for several days before planting them out in the spring. The physiological basis for such practice is this; the seedlings at the time of planting are still in the state of winter rest which is characterized by considerable dehydration of the cells. This is true of seedlings taken from nursery beds, and even more so in the case of seedlings transported over long distances or "heeled in" temporarily pending planting. Yet it is well known that in order to start growth the plants must first become highly saturated with water. Only in this way do the protoplasmic layers and cell walls become distended by fluids and acquire the state of normal turgidity essential to growth. Keeping the roots of the seedlings, prior to planting, for one or two days in water awakens them from the dormant dehydrated state to active growing condition and stimulates early appearance of foliage.

Experiments with activating the growth of seedlings with water were first tried in 1928 with exotic species at the Mokhov Forest Experiment Station in the Province of Orlov. The experiments were so successful that this method is now applied to all species being planted. In all cases there was 100 percent initial survival and vigorous healthy growth thereafter. Some of the plantations are now 18, 19 and 20 years old and they are all marked by high survival and excellent growth. It was found that seedlings so treated start growing 4-5 days ahead of untreated seedlings. Roots which were activated by being submerged in water begin growing very soon after planting, which in turn stimulates opening of the buds and the appearance of dense foliage. The effects are especially marked in seedlings whose root systems were trimmed. The ability of the seedlings to pass rapidly and energetically within a short time from the dormant winter stage into active growing stage is of great importance where the spring is short and the time of planting is characterized by sharp dry winds. It determines the rate of survival and the future of the entire plantation.

Venezuela

● In 1951 a reforestation project was under consideration for the denuded calcareous hills at an altitude of from 500-800 meters (1,600-2,600 ft.) around the town of Valencia and with an average annual rainfall of 1,100 mm. (43 in.). The area to be reforested is estimated to be 20,000 hectares (49,000 acres).

This project presents serious difficulties. The soil is very permeable and has deteriorated on account of burning, over-grazing and shifting cultivation. Vegetation is confined to grasses such as *Panicum maximum*, *Melinis minutiflora* and to shrubs and scattered fire-resistant tree species (*Psidium sp.*, *Couratella americana*, *Bowdichia virginlioides*, *Byrsonima crassifolia*). Only the dampest areas have maintained tree clumps, mainly composed of leguminous species (*Cassia moschata*, *Piptadenia*, *Machaerium*, *Entorolobium*).

The originator of the project proposed that, after property and eventual expropriation rights had been settled and the land adequately protected against fire and excessive grazing, there should be an intermediate stage in the process of reforestation in order to recreate a forest environment. Such reforestation could be carried out by different means simultaneously: natural seeding on land prepared mechanically or by hand around already existing tree clumps — by sowing on very small prepared plots, pot plantations, stump plantations, and normal plantations — preference being given at a later date to the methods which have proved to be most successful. The principal species to be planted either as seed or in plantations are likely to be *Bowdichia virgilioides* and *Byrsonima crassifolia*.

Logging and Engineering

Finland

● Felling contests have often been arranged in Finland and have aroused much interest both locally and abroad. After an interval of a few years, the idea was revived in 1951 and in October-November arrangements were made for the biggest contests held so far in which the State took an active part.

The contests were divided into three stages: communal heats, contests for the labor district championships, and for the State championship; the competitions consisted exclusively in the felling of pulpwood and fuelwood for common use.

The communal heats covered five consecutive days, the working time being 8 hours a day. The competitions between the labor districts were so arranged that the competitors were felling 8 hours a day on three alternate days and intermediate days they spent repairing their equipment and listening to experts giving advice on efficient working methods. The contests for the State championship took place between 27-30 November, and were arranged in such a way that competitors participated in the felling for 3 days, working 7 hours a day, and spent one day, chosen by lot, following the working methods and technique of other competitors.

More than 1,500 men reported for the communal contests. From each of these 15-30 competitors were chosen for the contests for the labor district championship. The central committee of the contests invited 35 competitors to the State championship contests.

In each class of the contest many prizes were given. Prizes for the state championship were: 1st, the title of Statemaster and 100,000 mk; 2nd, the title of second Statemaster and 50,000 mk; 3rd, the title of third Statemaster and 30,000 mk; 4th, 25,000 mk; 5th, 15,000 mk; 6th, 10,000 mk. Souvenir prizes and diplomas were also given and a great number of presents donated privately.

Earlier felling contests proved to be of considerable importance in arousing greater interest in forestry among the people. The workers' interest increased not only because they were able to see what results could be reached with the best possible

equipment and well organized work but also because they noticed the greater general public interest in their work.

UNITED KINGDOM

• Machinery used in forest nurseries and for the preparation of ground for afforestation closely follows agricultural practice, and it is mainly for extraction work that specialist machinery is required. Methods of extraction are changing in Great Britain as the main volume of the work is no longer the clear felling of mature trees but the extraction of thinnings in small sizes. Machinery developed for handling large individual loads cannot be used economically where comparatively small loads are spread over a wide area, as occurs in the early stages of silvicultural thinnings of plantations, and it is to deal with this situation that new machinery is now being developed. Not only must a small output per acre be economically handled, but distances to reach roadgoing vehicles in young forests are often great, and broken ground on steep hillsides is a frequent obstacle. The headquarters of the Forestry Commission maintains a machinery branch which (a) keeps contact with the agricultural engineering industry to watch any new development which may be useful for forestry; (b) initiates the design and production of special new forestry machinery.

Under (b) above, current development covers:

1. Cableways and chutes designed for easy erection on inaccessible sites where simpler methods are not applicable.
2. Mechanical loading of thinnings at the roadside.
3. Light tractors small enough to enter plantations in the early thinning stage.
4. Methods of providing transport over soft ground.
5. Mechanization of nursery processes such as cultivating machinery, seed sowing, root pruning, spraying, etc.
6. Ploughs for the preparation of ground for afforestation.
7. Mechanical methods for the removal of bark from posts and pitprops.

Information on new specialist machinery is available to owners of woodlands and also to the timber trade. Arrangements have been made for courses of instruction to be held periodically at which new machinery is described and demonstrated. Items of machinery are also exhibited at the major agricultural shows throughout the country.

Machinery of foreign origin is in some cases imported by the Forestry Commission but it is usual for foreign manufacturers to have an agent in Great Britain; where no agent exists woodland owners may, subject to import regulations, obtain equipment direct from abroad.

UNITED STATES OF AMERICA

• The Department of Industrial Relations, State of California, through its Division of Industrial Safety, has issued safety orders affecting logging and sawmill work. These include the following specific activities: use of hand tools; logging operations in general; felling, limbing, bucking and peeling; power saws; tractor yarding; donkey engines and donkey logging; lines, blocks and rigging; loading logs; motor trucks and trailers; log and lumber trucking; truck driving; private logging roads and logging railroads; blasting; log dumps, ponds and booms; stacking and unstacking machinery; veneer and plywood plants; pulp and paper mills; lath, shingle and shake mills. A vast number of safety devices and practices have been developed over the years, and these are taken into account in the very comprehensive set of orders.

Forest Injuries and Protection

UNITED STATES OF AMERICA

• At the conclusion of the second year of the Colorado Spruce Bark Beetle (*Dendroctonus piceiperda*) Control Project, a total of 987,000 trees had been treated or felled as trap trees. Important new developments in 1951 were the successful use of trap trees to absorb insect flights and the successful trial of a new insecticide, ethylene dibromide. The cost per tree was $ 3.46 in 1951, which is $1.20 more than in the previous year.

• A feature of a recent meeting of the American Society of Photogrammetry was a symposium covering the uses of aerial photographs in forest protection, believed to be the first ever held on this subject. Experts in different phases of forest protection contributed.

In the control of forest diseases, aerial photographs taken on panchromatic film with a minus-blue filter on a scale of 1: 20,000 are widely used in control work on white pine blister rust. Their primary value is in recognition and mapping of *Pinus sp.* stands preparatory to their selection for control treatment. This involves several steps. The first is to use the pictures to orientate the mapper on the ground. The second is to eliminate non-commercial timber areas or wasteland so that they require no field work. The third step is to identify on the photographs timber types in which the species in question usually does not occur. The fourth step is to determine and concentrate on timber types in which it is probable that the species is present and to conduct enough ground work to verify its presence.

In fire control, where suitable aerial photographs are available, they may be used as an almost complete intelligence source during major fires. Photography to a scale of 1: 20,000 studied by stereoscope enables the analyst to determine the topography types, hazards, barriers and similar facts ahead of the fire and thereby to plan control, and to provide other information needed for suppression measures. Photographs may also be used advantageously in mapping routes for men and machines to reach particular points, especially at night and where men are not already familiar with the terrain. The key to the best use of aerial photographs in forest fire control is in training field personnel to read and interpret the photographs and in the case of major fires, to assign highly skilled interpreters as part of the fire fighting team.

In the control of forest insects, the principal use is in the making of forest insect surveys. By making a mosaic (an overall picture built up from a large number of photographs) available to the observer and by flying over the area, it is possible to locate centers of insect outbreaks accurately. This method is now used on nearly 50 million acres (20 million ha.) of forested lands in the states of Oregon and Washington which are surveyed annually to locate epidemics of the spruce budworm (*Choristoneura fumiferana*). Research is under way to determine the most suitable photographic scale and film filter combinations for direct detection of outbreaks of bark beetles in the ponderosa pine and Douglas fir (*Pseudotsuga taxifolia*) stands of the western United States. Preliminary results so far obtained will require additional testing.

• A recent issue of "Fire Control Notes" has two significant articles in the realm of ideas and planning.

The first of these, by the chief pilot of the California region, U. S. Forest Service, examines the problems involved in the use of the helicopter. Experimental and operational experience with this machine over the past 10 years has settled, for the time being, the operational characteristics and potentialities as well as the costs. Pay loads are from 400 to 1,600 pounds (180-730 kg.); cruising speed about 50 miles (80 km.) an hour; useful range about 2 hours' flying time; and useable ceiling about 9,500 feet (2,900 m.). Perhaps the major potential use for the helicopter is to provide routine control in areas generally inaccessible by roads and trails and where a slow first attack on fires results in much larger outbreaks. Thus in such situations an area plan for helicopter use is needed. This will involve three types of development: (1) the permanent base with all facilities provided; (2) the semi-permanent or satellite base with maintenance, servicing and communications provided; and (3) the occasional field only as large as required and with services provided intermittently as needed.

The development of a satisfactory site for a given area involves, of course, correct decisions on many other sites of different classes and the time and space relation between them. The latter naturally depends on the calculated routine control needed for the forest types involved, which may range from as little as 20 minute control to several hours. If the helicopter is to be more than a casual and intermittent tool in fire suppression and is to be depended on for first attack, a new planning job faces executives and research workers.

The second article, written by the Assistant Regional Forester in charge of fire control, also in the California region, considers the existing problems between machines in theory and in practice. The new machines — the helicopter, radio, tractor and bombing plane — are alluring in their potentiality, but they have created organizational problems for their full utilization, and the problem of bringing actual practice up to theory has not been fully solved.

As for the helicopter, the vast increase in speed of detecting major fires and in transporting key men from one sector to another have not been fully prepared for. Dependable observation on an actual fire requires highly skilled and trained observers, not merely a forest officer. Smoke blankets, fog, darkness or excessive wind which make air operations impossible, must also be taken into account, and even though the helicopter may now be the primary machine for first attack or flexibility in big fire operations, the old standard ground travel methods cannot safely be ruled out.

The danger in using tractors is that insufficient men will be employed to backfire promptly from tractor lines. Evidently this is a current failure since many miles of tractor lines built to control major fires have been wasted through failure to backfire promptly.

Theory opens great vistas in the use of planes to bomb out fires or even to induce rain in selected areas. The simplest calculation of number of planes required and the cost of operations to cover vast forest areas with bombing operations indicates the economic impracticability of this temptingly simple method of controlling fires.

However, the advances in mechanization create a twofold problem. Firstly, to determine the conditions which must be satisfied to approach the full potential value of machines in first attack of small fires and in the control of big fires; this will require new kinds of planning and thinking. Secondly, the danger of accepting the potential of the new machines as reality, resulting in neglect of more prosaic, less dramatic ground methods of known worth.

Mensuration and Surveying

Puerto Rico

● The Caribbean Forest Experiment Station has developed a new method for determining age in the virgin rain forest of Puerto Rico. The customary technique of counting rings is unreliable, and the new method is based on the mathematical relationship between growth and time, and should solve one of the difficult problems in estimating timber growth in tropical rain forests.

United Kingdom

● Field work on the Census of British Woodlands was carried out from 1947 through mid-1949, and the office work has now been completed. A great deal of detail is contained in the recently published summary of this comprehensive survey. The main objectives were to map and classify all woodlands of 5 acres (2 ha.) and over, and to obtain an estimate of timber volume and increment of the woods remaining at the time of the survey. Private woodlands were surveyed by specially recruited and trained persons reporting on a standard form, and the Forestry Commission's woodlands were surveyed by staff officers. Over 308,000 separate stands were surveyed. All statistical information is reported separately for England, Scotland and Wales, together with the totals for Great Britain.

The total area of all woodlands is 3,448,662 acres (1,395,674 ha.), but it is estimated that an additional 187,000 acres (76,000 ha.) are in parcels of less than 5 acres (2 ha.). Thus the total area is 3.64 million acres (1.47 million ha.) or about 6 ½ percent of the land surface. Of the total area, 52 percent is in high forest classified as coniferous, broad-leaved or mixed; 10 percent in coppice classified as coppice only or coppice with standards; 15 percent in scrub; 4 percent devastated; 19 percent felled, classified as 8 percent before August 1939, and 11 percent since. Thus the total of scrub, devastated and felled — that is, relatively unproductive woodland — is 38 percent of the total. Slightly over 80 percent of the total woodland area is in private ownership, the remainder in state forests.

The distribution of age classes in total high forest woodlands is as follows: age 1-10, 14 percent; age 11-20, 16 percent; age 21-30, 10 percent; age 31-40, 5 percent; age 41-60, 7 percent; age 61-80, 8 percent; age 81-120, 9 percent; over 120, 5 percent; uneven aged, 26 percent. Although during recent decades the area of woodland has tended to increase, this increase has been principally in the state forests since, for example, the percentage in age 1-10 is 34 for state forests and only 6 for private woodlands.

Conifers account for 53 percent of the area of high forest, with Scots pine (*Pinus sylvestris*) making up 20 percent and European larch (*Larix decidua*), Norway spruce (*Picea abies*), and Sitka spruce (*Picea sitchensis*) 8 or 9 percent each. Among the broad-leaved species oak totals 24 percent followed by beech with 9 percent. State forests have less Scots pines (*P. sylvestris*) and European larch (*L. decidua*) than private forests, but far more Norway (*P. abies*) and Sitka spruce (*P. sitchensis*). Of the private woodlands, 83 percent are considered suitable for economic management, 4 percent are doubtful, and the remaining 13 percent are unsuitable.

Volume was estimated in cubic feet quarter-girth measure over bark. Total volume of high forest is 2,506 million cubic feet (71 million cu. m.), about half coniferous and mixed and half broad-leaved. Coppice with standards adds 153 million cubic feet (4.3 million cu. m.). Total current annual volume increment is estimated at 97.3 million cubic feet (2.8 million cu. m.), almost 2/3 of which is in high coniferous forest. In this category, private woodlands account for 34 million cubic feet (0.96 million cu. m.) and state forests for 29.7 million cubic feet (0.84 million cu .m.), whereas in the high broad-leaved forest category, private woodland forest account for 20.8 million (0.59 million cu. m.) and state forests for only 1 million cubic feet (0.028 million cu. m.).

Forest Management

Germany

● The period between 1890 and 1910 was marked in German forestry by a transition from light to heavy thinnings and the preparation of yield tables based on intensive thinnings. In a book entitled *Zwischen Schwacher und Starker Durchforstung*, the author, Dr. Hermann Kunanz, with the aid of new material, analyzes the effect of such heavy thinnings on the total yield and on the sustained and productive capacity of the forest. Considering the many variables that enter into the problem, such as the biological characteristics of the species, the quality of the site, the density and the age of the stands, this effect naturally varies with different conditions. The general trend, however, is toward lowering the total yield for the entire rotation period and decreasing the productive capacity of the forest. The study covers the beech, spruce, pine, and oak forests of Germany with special reference to the forests of the author's native state, Hesse. This is a highly technical treatise of particular interest to specialists in forest mensuration, although the results are of general application to the whole field of forest management.

JAPAN

● A study of the management of private coniferous forests in Japan by two American foresters shows that, in general, the private forests are being seriously damaged by heavy exploitation and destructive cutting practices. Although the forests of Japan cover 68 percent of the land area, conifers comprise only 15 percent of the forest area but provide 85 percent of the sawlogs cut annually. Since 78 percent of the coniferous forest is in private ownership, it is private forest management which must solve the insistent problem of providing material for construction and wood pulp, and of combatting floods and erosion. The situation is so serious that, unless effective action is taken to lower the rate of cutting, the saw timber will be practically depleted within 15 years, and a timber crisis will develop which will severely effect the whole economy.

The program recommended is designed to: (1) place the forests on sustained yield basis; (2) improve forest practices; (3) lessen erosion and floods from forest areas; (4) develop unproductive wastelands into valuable forest; (5) provide constructive employment for those deprived of work through the reduction of fellings; (6) give the national government the necessary supervisory powers to make the program effective; (7) be reasonable in cost as compared with the benefits to be derived. In order to implement the program, legislation is required providing for state control of timber cutting on all private lands except very small holdings, for field inspection, and for expanded services.

UNITED STATES OF AMERICA

● The larch (*Larix occidentalis*) — Douglas fir (*Pseudotsuga taxifolia*) stands of the Upper Columbia Basin have been and are being cut over in many ways, and a method for predicting future growth of residual stands is needed for use in management plans. Several variables are involved: size of trees, period of time after logging, vigor of trees, density of the reserve stand, precipitation, number of trees growing into the 10 inch (25.4 cm.) DBH class at various intervals after logging, mortality of reserve trees at different intervals. Recently the Northern Rocky Mountain Forest and Range Experiment Station has prepared tables and worked out methods of application whereby forest managers may predict future growth of reserve stands, and determine the intensity of cutting under selection systems, and the kind of trees to cut or leave.

● The watershed management research in Southern California, carried on for 25 years by the California Forest and Range Experiment Station, has established a sound basis for estimating the effect of denuding watersheds by fire. In general, the results are as follows:

Size of storm	Increase in peak flow following fire	Period of return to normal flow
	Times	*Years*
Small	10-30	20
Medium . . .	3-10	40
Large	2-3	60

During the first year after complete burning of good chaparral cover the erosion rate is increased about 35 times, and during the period of 8 to 10 years before erosion rates return to normal, they average 9 to 10 times those before burning. These rates are greatly increased if deep gullying follows fire, but quantitative measurements have not yet been obtained. Annual erosion rates on areas unburned for 10 years or more vary from 640 to as much as 6,100 cubic yards per square mile (189-1,801 cu. m. per km^2) on different watersheds, reflecting geological and soil factors. Annual erosion rates the first year after fire vary from about 19,000 to over 176,000 cubic yards per square mile (5,609-51,957 cu. m. per Km^2).

This work indicates clearly the extreme importance of maintaining mature stands of undamaged chaparral and the serious effect of even moderate-sized fires on useable waterflows and on the storage capacity of reservoirs in individual watersheds.

Forest Products and their Utilization

AUSTRALIA

● The disastrous fires of 1939 in Victoria, Australia, killed large volumes of *Eucalyptus regnans*, and the problem of methods of salvage was undertaken by the Forest Products Laboratory. Earlier experience had shown that standing fire-killed trees lasted a far shorter time than those which were felled and covered by undergrowth; experiments therefore dealt with prompt felling and dumping under continuous water sprays which appeared to offer a chance for better salvage yields. The result was a 56 percent recovery, based on full cut quarter-sawn material, or 41 percent for standard grade or better, based on rigid grading. Both these figures are regarded as satisfactory. The percentage recovery of standard grade was highest in middle logs (56 percent), intermediate in butt logs (38 percent), and lowest with top logs (29 percent). The general conclusion of the study is that, with dumping and spraying fire-killed timber, satisfactory utilization can be obtained for at least 9 years after the fire. Further work is planned comparing other salvage methods.

UNITED STATES OF AMERICA

● A patent has been granted to technical officers of the Forest Products Laboratory at Madison for a method of reducing shrinkage, swelling and hygroscopicity of wood. The wood is kiln-dried to a moisture content of 2 to 4 percent, then exposed to water-free formaldehyde vapor, and subsequently to water-free nitric acid in vapor form, the chemical treatment being carried out at 140° to 230° F. Length of treatment depends on thickness of the wood. So far the treatment has been successful on wood veneer, and holds promise as an effective treatment of other lignocellulose materials for stabilizing dimensions of wooden articles.

● In recent years much experimental work has been carried out on direct-heat kilns in which the heat generating mechanism is close-coupled with the drying chamber and is an integral part of the kiln. The main advantage is that the kiln is an independent unit, requiring no boiler, and is thus suited to the needs of small mills and remanufacturing plants which have no steam plants. Other advantages are: (1) the economy of operation, since the heat production per unit of fuel is immediately available for utilization in the drying chamber; (2) the moisture generated by fuel combustion is available for controlling the humidity within the kiln, a feature particularly valuable with species requiring high humidity during drying; (3) this type of equipment is relatively easy to operate; (4) both initial cost and operating costs are low.

The main disadvantages are: (1) the fire hazard, although recent gas and oil burning kilns have been designed to reduce it; (2) there are still difficulties in attaining the final high degree of humidity required for stress relief, although this problem is gradually being solved. There are several types of direct heat kilns under commercial test, and further improvement of design is to be expected.

● For the past 15 years the North-eastern Wood Utilization Council has been concerned with methods of utilizing low-grade wood as fuel, as a means of encouraging and making practicable a vast amount of improvement cutting needed in the forests of the north-eastern region. One of its earlier bulletins, "How to Burn Wood," has gone through six editions and is recognized as authoritative. In 1951 the Council held a conference on wood fuel at which authorities on various aspects of the subject presented papers dealing with general aspects of fuel, and with the most recent advances in stick wood, chipped wood and briquets; the conference also produced a handbook on the use of wood for fuel.

Oven-dried wood of any species has a calorific value of about 8,600 b.t.u. compared with about 12,000 for anthracite and about 14,500 for the highest grade of steam coal. Moisture in the wood greatly reduces the

useable heat which is 7,100 b.t.u. for oven-dried wood, 5,700 for air-dried, and only 3,400 for green wood. Gross calorific values have been established for the principal species and the number of air-dried cords required to equal 2,000 pounds (900 kg.) of anthracite coal varies from 0.98 for rock elm (*Ulnius thomasi*) to 2.00 for black cottonwood (*Populus trichocarpa*) among the hardwood species, and from 1.35 for western larch (*Larix occidentalis*) to 2.40 for balsam fir (*Abies balsamea*) among the softwoods.

The decline in use of wood fuel has been due principally to increasing labor costs of making and transporting fuel wood by traditional hand methods. Modern advances in mechanization have made it possible to cut the man-days per cord to one-third or less of the traditional figure. The improvements include the one-man chain saw, the crawler tractor with a rear-mounted winch, the bucking ladder or bucking chute, mechanical splitters, explosive wedges on circular rip saws for splitting, conveyor loaders, steel strap or cable for packing bundles of a cord or more, and booms for loading. Equipment is now available to produce fuel as sawdust, hog fuel or chipped fuel. Gravity feed stoves have been perfected to handle and burn efficiently the various forms of chipped fuel, the main requirement being that the chips are cubical, range from 1/4 in. (0.64 cm.) down in size, and contain a good percentage of very fine material which has good flow characteristics.

A spreader stoker has been developed for firing wood and coal mixtures in multiple fuel furnaces. Machines have been perfected to utilize forest waste, with no additional material, so as to produce briquet fuel 3 to 3 1/2 times the original density, so firmly knit that it sheds less dust in handling than most solid fuels. The briquets are small cylinders 1 1/2 inches (3.8 cm.) in diameter, broken into short lengths having an average heat value of 9,000 b.t.u. per pound. This fuel is marketed in bags and is therefore readily handled.

The use of modern methods and equipment needs to be widely promoted as a means of creating a market for much low-grade forest material.

Forest Policy

India

● A short pamphlet of less than 25 pages has been published containing the principal recommendations made to the Government of Assam by the Chief of the Indian Forest Service following his recent visit. It delineates in lucid summary the main problems facing the State of Assam both in the sphere of general forest policy and in silvicultural methods and administration, without at the same time neglecting certain questions of temporary interest, such as the salvage of timber carried away by rivers following the earthquake of August 1950, which caused serious damage in the north-east of Assam.

Situated in the extreme north-east of the sub-continent of India against the foothills of the Himalayas, Assam is topographically rugged, a feature which has carried it through numerous vicissitudes of history, but which, further aggravated by the serious obstacle of the Brahmaputra, has not only deprived it of good communications but isolated it from the recent political changes. The rugged character of the land naturally affects its forest policy and the report rightly recommends that this policy, up to now based on the production of sal (*Shorea robusta*) and teak (*Tectona grandis*) should be directed towards the development of industries using pyrethrum, quinine, tanning and medicinal herbs, etc., all products the transport of which outside the province is simpler than that of timber. This also applies to the paper industry, which has a promising future on account of important supplies of bamboo.

The report also emphasizes the lack of reserve forests which constitute barely 13 percent of the total land surface of Assam and only 19 percent of the forested area. Private forests cover 60 percent of the hills and the vast plateau of Shillong and are subjected to harmful and uncontrolled shifting cultivation, here known has "jhuming." As elsewhere, the solution of the problem of shifting cultivation requires the joint efforts of all concerned with the development of agriculture, grazing, silviculture and forest industries. The author of the report estimates that, by reason of the topography, the high rainfall (it holds the world record with an average annual rainfall of 12 m. 50 [492 in.] at Churapuji) concentrated in the four months of the monsoon season, and the speed of growth, at least 25 percent of the country should be given over to permanent forests.

The report continues with some interesting comments on the planting of suitable non-coniferous species with a view to assuring a regular supply to match and veneer factories, and also on the planting of *Cinchona sp.* and *Acacia mollissima*. Particularly noteworthy is the recommendation for extending the method of regenerating *Pinus khasia*, which consists in endeavoring to regenerate on plots of land where potatoes have been planted for one or two years. This method, which turns a costly operation into a profitable one has been favorably received by growers in the districts concerned, who obtain exceedingly rich crops.

Finally the report deals with the question of the re-organization of the Assam Forest Service and emphasizes in particular the need to revise forest management at regular intervals. Stating that in more than half the forest divisions of the country the working plans had expired without having been revised, the author concludes: "The seriousness of the situation can only be realized if it is remembered that in the adjoining States of Bengal, Bihar, Orissa and Uttar Pradesh, any private owner forfeits the right of managing his own forest should he be found without a proper working plan."

Israel

● During 1950/51 a start was made with the implementation of the Government's large-scale afforestation plan which is to comprise the planting of about 100 million trees during the course of the next ten years. The long term object of the plan is soil conservation and improvement, as well as the establishment of a home supply of forest products which are very limited at present. The rate of planting, however, is determined by short term considerations of employment: afforestation work affords large employment possibilities for unskilled labor, enabling new immigrants to be usefully employed without necessitating large capital investments in equipment, etc. Afforestation is carried out by the Government's Department of Forests, as well as by private trusts. The following figures refer to Government activities only, but they reflect the extent and impetus of afforestation work:

Sum spent on afforestation . .	£ 1 790 000
Number of working days . . .	363 000
Number of trees planted . . .	3 140 000
Number of tree seedlings supplied to other users	3 690 000

Areas planted

	dunam [1]
Mountainous areas:	
a) New plantations	13 230
b) Replacements	4 530
Sand dunes	1 750
Stream banks, etc.	250
Sundry	325

[1] 1 dunam = approximately 1/10 hectare.

In addition, the planting of trees along the highways was continued. Whilst 95 km. (59 miles) were planted in 1950, 211 km. (131 miles) were planted during the current year, comprising 397,000 trees.

Research activities have been extended. The Government Forest Research Station has added to its laboratories and has extended the scope of its work which includes ecology, genetics, forest products utilization, variety trials, etc. Special attention is being paid to the exploration of afforestation possibilities in the Negev.

The administration and tending of existing forest reserves is engaging the attention of the Department. Grazing in forest reserves is being strictly controlled and it is noteworthy that the absence of flocks has already brought about remarkable instances of regeneration in areas where vegetation was previously confined to a sparse cover of low shrubs. Although the State is at present facing considerable economic difficulties to the solution of which an afforestation program cannot in the short run contribute, it is felt that the long-term benefits will fully justify the effort being made.

JAPAN

• To rectify the geographically unbalanced distribution of national forests, the Law for National Forest Temporary Reorganization was passed by the Diet in 1951. This enables either the sale of national forests, which do not need to be operated by the National Government, to local bodies and other organizations considered capable of managing them properly, or exchange of national forests in return for more suitable private forests. The national forests coming under the law are: (1) isolated and small national forests; (2) national forests which cannot easily be worked with other national forests due to transportation difficulties; (3) national forests intermingled with private forests and difficult to operate; (4) national forests managed for the purpose of supplying firewood and charcoal to local inhabitants for their own use. The sale or exchange of a national forest is made to local self-governing bodies, etc., in whose areas the forest is located. Under this law, the Government is planning to sell forests of 225,830 hectares (558,030 acres) and stumpage of 10 million m^3 (353 million cu. ft.) in the next three years.

NEW ZEALAND

• An integrated newsprint, pulp, and timber industry, based on the Kaingaroa State forest in the center of North Island, will be operated by the Tasman Pulp and Paper Company, and the Government's contribution will include provision of a harbor and railway, and power transmission lines.

The enterprise may be started early in 1952 and established in about three years. It will be the largest single industrial plant ever established in New Zealand and will provide an ample supply of newsprint and other products, with a large surplus of export to Australia.

SWAZILAND

• The British Colonial Development Corporation is said to be planning a newsprint mill in an area of Swaziland where there are already extensive pine plantations.

UNION OF SOUTH AFRICA

• It has been reported that Canadian and South African interests are planning to establish South Africa's first newsprint mill, using pine pulpwood grown in East Transvaal. The project would involve an investment of over $10 million.

UNITED STATES OF AMERICA

• The legal history of the National Forests and of the U. S. Forest Service began with the Act of 3 March 1891, which was the basis for the creation of National Forests by executive action. Since that time, many additional laws have been passed by the Congress of the United States as new problems were recognized. Periodically the U. S. Department of Agriculture revises and brings up to date a publication giving the various laws which govern operation; the latest revision is that of May 1951.

• *The Yale Law Journal* has prepared a concise and comprehensive statement dealing with the management of public (i.e., nationally owned) land resources. The text itself is brief, but there are 188 citations to establish the points made. Essentially the paper examines the contrasting competence of the U. S. Forest Service of the Department of Agriculture, and the Bureau of Land Management of the Department of the Interior in the management of timber, range, and watersheds on the public lands, as a background for taking a position on the report of the Commission on Organization of the Executive Branch of the Government, the so-called Hoover Commission, which reported in 1949.

In the Commission's work it was universally agreed that consolidation of the Forest Service and the Bureau was necessary, but as already described in *Unasylva* the groups studying the two departments disagreed as to where the consolidation should take place. The Commission decided on Agriculture, and the majority choice was good for several reasons. First, the Forest Service's research facilities are far more extensive than those of the Bureau of Land Management, and the Service receives assistance from other Agriculture research bureaus. Second, the Forest Service has a better conservation record; the improving condition of national forest, range and timber is directly attributable to the success of Forest Service policies. Third, the Forest Service has maintained independence from users of range land, whereas the Bureau has been forced to cede many of its powers to the stockmen whose activities it is supposed to regulate. Finally, Congress apparently lacks confidence in the Bureau, and its approval of a consolidation of range and forest administration in that agency seems too much to hope for; the Forest Service, on the other hand, has wide public support for its efficient and impartial practices. Unification of public range and forest activities in agriculture is both a practical and desirable short-range objective.

This is an admirable and dispassionate examination of a problem of paramount importance to public land management in the U.S.A.

Reviews

It is the policy of FAO to review here only selected publications which appear to have a direct bearing on the current work of the Forestry Division.

THE ARBOREAL FLORA OF ISRAEL AND TRANSJORDAN AND ITS ECOLOGICAL AND PHYTOGEOGRAPHICAL SIGNIFICANCE. M. Zohary. pp. 59. Imperial Forestry Institute, Oxford, England. Institute Paper No. 26, 1951. Price: 5s. 0d.

The territory that was once Palestine has marked topographical variations and a wide range of soils. It is a meeting point of three climatic regions, and phytogeographically it is divided into three zones: Mediterranean, Irano-Turanian and Saharo-Sindian. Each zone has distinct climatic, vegetational and agricultural features. The vegetation, including trees, has come into the country at various geologic periods and from several sources, and there are five main regional groups. Their behavior after establishment in Palestine has depended on the climatic changes which have taken place during geological evolution.

Man's activity has greatly affected the present distribution and abundance of trees and forests, in some cases obliterating them or reducing them to scattered relicts. It is thus of obvious value to foresters and agriculturalists, and to those dealing with conservation of soil and water supplies, to understand what the natural climax types are on the highly varied areas of the country, and it is to this problem that the author has addressed himself. Sixty-two tree species are considered. For each of these the distribution in the region is given at length, and for rarer species precise localities are recorded. For many of them the soil and climatic requirements are given as well,

and for most of the species the probable origin or affiliation with the recognized groups of origin is shown.

To those dealing with the energetic afforestation and conservation programs now being undertaken in the area, it is clear that this fundamental investigation will be of value.

DISTRIBUTION OF TREE SPECIES IN THE SUDAN IN RELATION TO RAINFALL AND SOIL TEXTURE. J. D. Smith. pp. 64 and 23 maps and charts. Bulletin No. 4. *Ministry of Agriculture, Khartoum, Sudan.* 1951. Price: 8s. 0d.

This bulletin is a remarkable contribution to research on the distribution of woody species in arid tropical climates, and, since it establishes a method which can be used in similar research elsewhere, its importance reaches far beyond the confines of the Anglo-Egyptian Sudan. It concludes with a description of afforestation methods used in the Sudan in regions having very low rainfall — methods which have been developed as a direct result of this research and which seem already to have produced interesting results.

It is not easy to summarize still further a concise and informative bulletin, but in short, the Sudan receives an annual rainfall ranging from zero to 1,400 mm., rising steadily from north to south, and has in the north and north-east an area of sandy soil and in the south-west vast clay plains. The most striking feature about the distribution of the species (which consist chiefly of *Acacia* spp. in the north and mixed deciduous forests in the south) is that while in each of these two zones the distribution axis is of course parallel to the isohyets, it occurs at a relatively much higher rainfall level on clay soil than on sand. Where the two zones meet there is therefore a break in the distribution axis.

After investigating this situation, the author has arrived at the conclusion that the apparent high degree of tolerance of the species in relation to rainfall and soil texture (relative clay content) would be quite the opposite if the two factors were considered simultaneously. A study of the natural vegetation on the various datum soils (i.e. soils whose texture has attained a climax equilibrium in relation to the normal precipitation, an equilibrium which is marked by the fact that all of the precipitation is absorbed and retained against the forces of gravity) has enabled him to draw up charts for the principal species of the Sudan, the co-ordinates of which are the percentage clay content and the total annual rainfall. These charts are of primary importance in determining the conditions under which a given species can be introduced by artificial regeneration.

A further indication from this research is that the regions which are best suited to planting with species whose rainfall requirements are known, are not those with a relatively high clay content — which would appear to be the more moist — but rather sandy soils previously considered arid. In effect, afforestation on clay desert, which has always constituted a major problem, has only been successful after the re-establishment of sand cover by means of "sand-traps." It has been possible to establish *Prosopis juliflora* by this method, even in very arid soils. This plant is of major importance since it is resistant to goat-grazing and in addition provides considerable quantities of firewood and a highly nutritive pod-fodder for cattle.

CANADIAN WOODS: THEIR PROPERTIES AND USES. Canadian Forestry Branch, Forest Products Laboratories Division. pp. 367, illus. *Department of Resources and Development, Ottawa, Canada,* 1951. Second edition. Price: Can. $3.00.

If anyone wishes to know what productive forestry adds up to, he may well be referred to the 1951 edition of *Canadian Woods.* This is a book of which the Canadian Government and all who participated in its preparation and publication must feel proud. It brings up to date the numerous results of investigations of the Forest Products Laboratories during the past 18 years. As D. A. MacDonald, Canada's Director of Forestry, says in the foreword, "research is an unending task, seldom spectacular, always progressive and one that adds continually to the fund of basic and specific data readily available. There have been many developments since... 1935, all intended to promote and facilitate more effective wood utilization." There can be little question that the present edition adequately portrays the vital role wood plays in Canada's national economy.

The early stages of the preparation of the book were supervised by T. A. McElhanney, Superintendant of the Ottawa Laboratory, now retired; the present Chief of the Forest Products Laboratories Division, J. H. Jenkins, was responsible for the final directions. Seventeen individual members of the Vancouver and Ottawa Laboratories prepared the separate chapters covering Canadian woods; commercial timbers and their classified uses; structure; mechanical and physical properties; seasoning of lumber; decay and stains; preservative treatment; chemical utilization; secondary wood-using industries; veneers, plywoods and wood adhesives, including good descriptions of glues and gluing and of dielectric heating; glued laminated constructions; shipping containers; timber fastenings; and pulp, paper, and related products.

The text is concisely written, there are illustrations, and statistical tables.

Besides the brief descriptions of the principal commercial timbers of Canada, the book includes a good list of definitions of terms used in the lumber industry, the numerous uses of Canadian species, a key to the identification of woods commonly used in Canada, and selective lists of reference. Other useful items are a tabulation of the advantages and disadvantages of different types of dry kilns, drying schedules of many woods, chemical analyses of a large number of species, heating values of woods, standards of plywood sizes, and a number of formulae used in computations in the various tables.

Especially to be remarked are the lay-out and design of the publication which make it an attractive accounting to the Canadian people of the work of the country's technicians.

AMERICAN WOODS. Shelley E. Schoonover. pp. 250. *Watling & Co. Santa Monica, California, U.S.A.* 1951. Price: U.S. $7.50.

This attractively illustrated book is written for the man who enjoys wood, who appreciates the beauty of figure and color, and tries to bring out these properties by his own skill in shaping and finishing wood into useful objects. Such wood craftsmen, designers, and artists, will find here interesting and practical information.

The author has not attempted an exhausting listing of species, but he has made a useful selection of those which are representative of larger groups or genera. Especially helpful are the chapters dealing with the structural characteristics of wood to explain in a non-technical way, how a tree grows, the difference between springwood and summerwood, and between sapwood and heartwood. On the practical side, the discussion of methods of cutting logs into lumber and veneers, the seasoning of wood, and the grain and figures in wood, will be found informative.

The major part of the book is devoted to individual species, over 40 softwoods or conifers, and over 90 hardwoods or broadleaved species. For most of these the author gives a description of the tree, its growth range, the characteristics of the wood and the uses.

A list of references, and of dealers who can supply various woods should prove of value. The 10 page index makes it easy to find any desired information in the book.

WATER AND MAN, A STUDY IN ECOLOGY. J. Forman and O. E. Fink. *Friends of the Land,* Columbus, Ohio. 1950. Price: $4.50.

The papers which make up this publication were presented at the eight annual meeting of the "Friends of the Land," a non-profitmaking, non-partisan organization concerned with the conservation of natural resources. This organization was founded some ten years ago by officials, professors, farmers, bankers, writers and citizens interested in public welfare, and it continues to draw its members from many and varied walks of life.

It works through education and propaganda rather than through political action, and produces a quarterly review, "The Land," in which appear original articles — appraisals of situations, legislative proposals

and trends by experts and laymen, essays, reviews and choices of new books, letters and notes.

The papers that make up the present volume — edited and supplemented by members of the organization — were contributed by 30 eminent authorities and deal with many aspects of the central theme: splash erosion on bare soil as the start of trouble; uncontrolled water forces; the use of water and its influence on civilizations, plants and animals; the prime facts about watersheds; increasing needs for water for irrigation purposes, air conditioning and industry, as well as actual or developing shortages; the results of river pollution; the problems of mineral content and purity.

There is little in this book that is new to the specialist. It is, rather, a sound but brief recapitulation of known facts. Its value lies in bringing together in one place a competent summary and interpretation of so vast and important a subject. Informed opinion is essential in stimulating conservation and its ally forestry. The intelligent layman, the non-technical official and the student of civilization will all find valuable information and so will the practising forester.

DANMARKS SKOVFYPROBLEM (Scots pine problems on the heath and dunes of Denmark) s. l. (Beretning nr. 151) English Summary. E. C. L. Løfting. *Danish Forest Experiment Station.* Copenhagen. 1951. Price to be supplied later.

Reporting on the importance of climatic conditions for growth limits and choice of provenance, Løfting shows what races of Scots pine (*P. sylvestris*) should be used in the heath and dune areas of Denmark and indicates the silvicultural possibilities of specific areas. He points out that choice of proper provenance should result in wider use of this species in regions where spruce does not thrive and also, as an auxiliary, where spruce does well, for example in the heath regions of central Jutland. He also shows that because of its sensivity to variations in climate, the various races of Scots pine are good indicators of growing conditions in different regions; however, the limiting factors of this species are often different from those of other species, and the behavior of Scots pine should not be taken, therefore, as a guide to the behavior of other species.

The report also contains a geographic survey of Scots pine distribution in Europe which shows that this species occurs on dry hot southerly slopes in northern-continental climates, as well as in Atlantic climatic zones. Optimum sites are found in East Prussia and the Baltic countries and in particular areas throughout Sweden.

An historical survey of the seed trade shows that most of the Scots pine seed imported into Denmark was of a too "southern-continental" origin, thus accounting for the poor results obtained except on particularly suitable sites.

The author summarizes the experience from provenance tests in other countries from the standpoint of application to Danish silviculture; he describes the results of cultivation of this species in Denmark, and the comparative behavior of individual plantations of different provenance, particularly with regard to straightness or twisting of the main stem and character of branching.

In an effort to relate growth to climatic conditions Løfting estimated the average temperature (pentatherm) and the average monthly precipitation (penta-precipitation) during the 5 months May-September and plotted them on maps. He then computed a ratio as the "reduced rainfall factor" from these two values by reducing the monthly penta-precipitation (the numerator) in millimetres by 30 mm. and the pentatherm (the denominator) by 7 degrees, in order, as he says, to bring their zero points "into a position where the precipitation and temperature begin to affect the development of Scots pine." This fraction expresses the moisture conditions of the growing season, but can serve only as a rough guide. He then mapped these ratios and examined the terrain and such soil conditions as water-holding capacity and humus conditions, to compare the development of spruce, Austrian pine, and Scots pine.

Comparisons were also made of penta-terms above and below ground level. On the basis of these comparisons and the "reduced rainfall factors" and behavior of tree plantations, the author lays down certain rules for the choice of provenance of Scots pine for Danish conditions.

It would be interesting to see the results of similar studies in a number of countries, done as carefully as this one, to provide forest planters with a useful guide that would enable them to avoid the choice of unsuitable species or races of individual species for various planting conditions.

DAS RÜCKEN DES HOLZES. (Logging Techniques). H. Gläser. *Bayerischer Landwirtschaftsverlag. Munich.* 1951. Price: DM. 5.20.

In forest economy the operation of logging has up to now played the rôle of Cinderella. While felling and woodworking methods have been studied in detail and the development of improved transport systems is far advanced, logging is still largely governed by tradition. This is perhaps attributable to the fact that it occupies a borderline position between producer and consumer, being an operation which falls as much to the lot of the forest owner as to the timber contractor or even to the purchaser. It is, however, due above all to the fact that it depends largely on local conditions and variable factors, including the terrain, condition of soil, composition of the stand, climate, stocking, transport facilities, etc. As these factors can vary indefinitely, it is extremely difficult to establish general principles for logging, and, in fact, the possibility of introducing standard practices is virtually excluded. It is, nevertheless, an important link (and often the most costly) in the chain of operations by which a tree is converted into economic wealth. In this present publication — a volume of 250 fully illustrated pages — the author has collected the most important current information in this relatively unexplored field.

After outlining certain general principles — of which one could have wished to see the question of transport networks treated more fully — the author examines the factors involved and the opposition likely to be encountered in improving logging methods. He discusses the methods of extracting long logs; the extento to which manual labor and the force of gravity can be used, as well as draught animals, tractors, winches, teleferics, skidders, and their accessories, such as carts, sledges, attachments for dragging by means of cables and pulleys, sulkies and trailers. All the most recent methods developed in Germany, Switzerland and Austria, with several pages devoted to American skidders, are described briefly and some indication of production and operation costs given. France, among other countries not included, could have provided interesting examples of logging developments wihch should have helped to make this section more complete.

A second section of the book is devoted to the logging of quarter logs and ordinary logs and their means of transport — by hand, by carts and sledges, draught animals, jeeps and tractors equipped with trailers or sledges, or by cable and teleferic.

In conclusion, the author gives some indication of the time required for logging different kinds of timber in given conditions, and attempts a comparison of the various methods. For example, skidders do not lend themselves to conditions in Germany, where the horse and the tractor are the chief means of logging; for numerous reasons — among them social reasons — the horse remains the primary logging "machine." For fuel wood the lumberman requires hand carts to avoid manual transport, the most arduous of forest operations.

One should not expect this book to provide a synthesis of logging techniques, which at the present stage of development it is not possible to establish, nor yet ready-made methods for an operation which above all others is dependent on local conditions. What one does find is a concise description of a large number of different techniques, and a mine of new ideas which will help the individual to choose the most suitable methods for his particular conditions. In this respect the author has indeed attained his object of arousing interest in a much neglected branch of forest exploitation.

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